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**MENOPAUSE AND THE FEMALE SINGER: A SURVEY OF PHYSICAL AND PSYCHOLOGICAL CHANGES, AND OF THE AVAILABLE TREATMENTS AND HOW THESE AFFECT THE VOCAL PERFORMER.**

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**A minor dissertation submitted in partial of the requirements for the award of the degree of Master of Music/ Performers/ Solo Voice**

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**2006**

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## ABSTRACT

### **Menopause and the female singer: A survey of physical and psychological changes, and of the available treatments and how these affect the vocal performer.**

The purpose of this study is to make singers and their colleagues aware of the functioning of their bodies and of the methods that can be used to care for the singer's body, especially the voice, from an early age so that the influence of menopause will be reduced.

The study considers the various systems of the body that are relevant to the singer and details how these systems usually function, before examining the various types and stages of menopause. It looks at how menopause affects a singer's body, addresses the diseases and symptoms that menopause may cause, details possible treatment for these diseases and symptoms, and provides information as to how these treatments may affect the singer as a performer.

Various singers were interviewed to establish how their careers as professional singers were affected by the stages of menopause, the treatment they received, and how this treatment affected their careers. Professionals in the fields of gynaecology, psychology and otolaryngology were interviewed who had treated singers suffering from illnesses that could be attributed to menopause. They were asked to provide details of the treatment that they prescribed and to describe how this treatment influenced the performing careers of these singers.

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# **CHAPTER I**

## **INTRODUCTION**

The voice is the primary mechanism of human communication; it has the ability to convey not only factual information but the entire gamut of human emotions. In my career as a professional singer I have come to realize that the human voice is a delicate, remarkable and highly complex instrument.

The singer uses his or her voice during a performance as a musical instrument, impressing the listener with the control of tone and breath, the range of colour and dynamic levels, and the aptness of phrasing and stylistic usage. The voice is also used to communicate with the audience at other levels. This communication includes verbally delivering the text and conveying emotional and psychological nuances about the meaning, narrative, and speaker that are not expressed in words.

Singers know that allowing themselves to actually feel the emotion being presented to their audience during a performance results in the emotion being more effectively conveyed to their audience. In addition to the aspect of vocal communication, the singer also uses their facial expressions, bodily movements, and body language to communicate with their audience.

During the lifetime of the female singer several changes to the body are experienced, such as menstruation, pregnancy and menopause. These changes have both a physical and a psychological effect on the singer's vocal and physical performance.

In order for us to understand menopause and the female singer better, it is necessary to give a brief overview of the systems of the human body which are relevant to the female singer and her wellbeing. The study will focus on how changes to these systems during menopause affect the singer physically and psychologically, and will look at available medical treatments that might be able to assist the performer.

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## **CHAPTER II**

### **SYSTEMS OF THE BODY RELEVANT TO THE SINGER**

Unless otherwise specified, all information relating to human anatomy is extrapolated from Gray, H., *Anatomy of the Human Body* (2000) [Online].

#### **The skeletal system**

Information condensed from Minnesota State University, *The Skeletal System* [Online]

##### **Overview**

The skeletal system is formed by a total of 206 bones. The bones are connected by ligaments and the point where two bones meet is referred to as a joint. The skeletal system provides the body with many functions. It supports the body, enables movement, gives it shape, and stores vital minerals, such as calcium and phosphorus. The blood cells of the body are produced in the marrow that is found in some bones. The bone marrow produces an average of 2.6 million red blood cells every second.

The human skeleton is divided into two parts, the axial skeleton and the appendicular skeleton.

##### **The axial skeleton**

The axial skeleton consists of bones that form the axis of the body and support and protect the organs of the head, neck and trunk.

## **The skull**

Information condensed from Minnesota State University, *The Skull* [Online].

The skull forms the framework of the human head and it has eight cranial and fourteen facial bones.

### **Cranial bones**

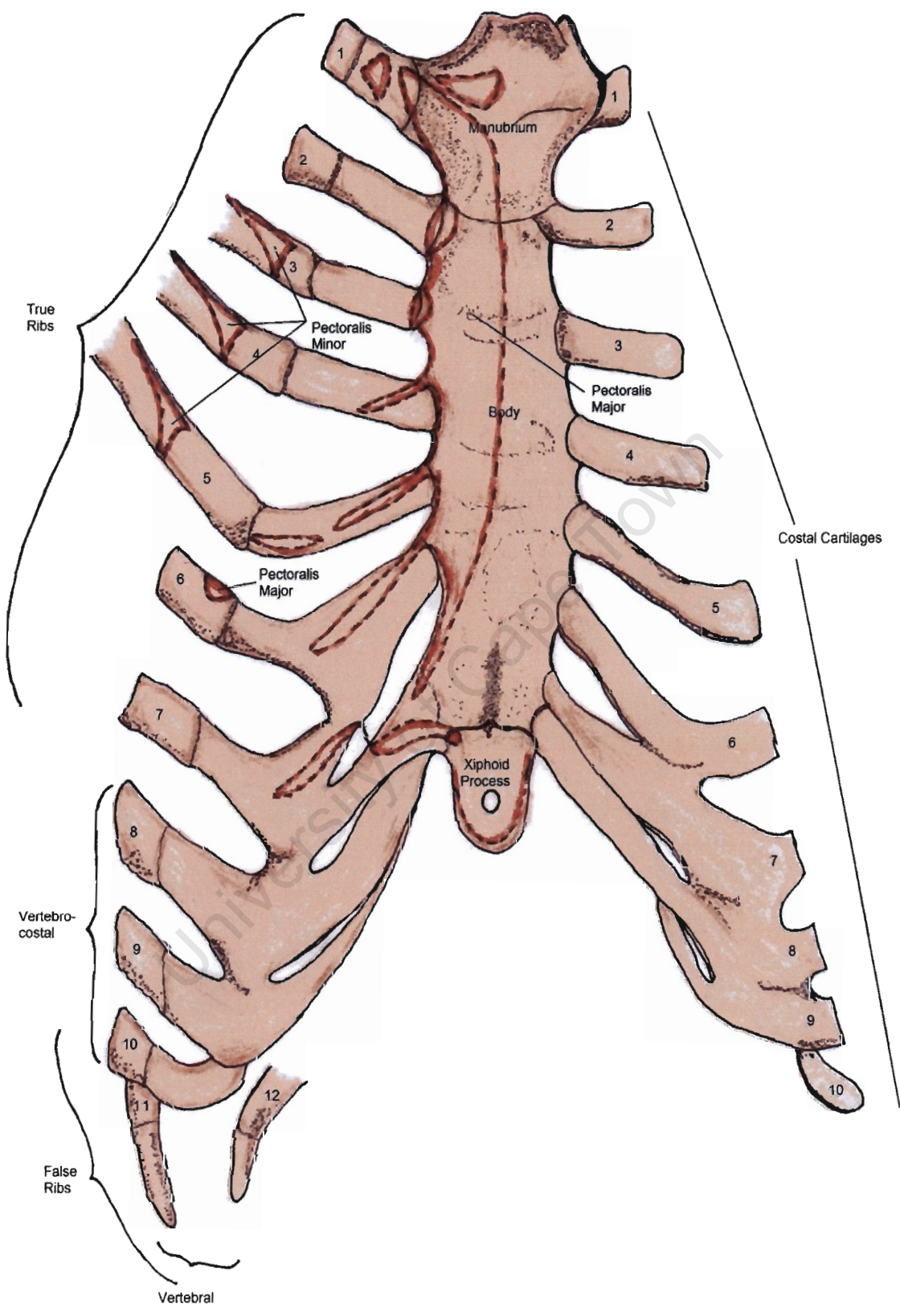
The cranial bones are a framework that serves as protection for the brain and they are named as follows:

- The *frontal bone* forms part of the cranial cavity and the forehead, the ridges of the brow, and the nasal cavity.
- The *ethmoid bone* forms the bone between the orbits and the roof of the nasal cavity.
- The *parietal bone* forms the superior and the lateral parts of the cranium.
- The two *temporal bones* form the lateral walls of the cranium and are the place where the external ears are sited.
- The *occipital bone* forms the inferior and the posterior part of the cranium. This is the part where the neck articulates.
- The two *sphenoid bones* comprise part of the floor of the cranium.

### **Facial bones**

The facial bones make up the upper and lower jaw and other facial structures. They are named as follows:

- The *mandible* is the lower jaw bone and it articulates with the temporal bones. This joint is the only movable joint in the entire head and is called the temporomandibular joint. We use this joint to chew with.
- The *left and right maxilla* are the upper jaw bones. These bones form the roof of the mouth, the orbits, and part of the nose.
- The *left and right nasal bones* are the superior part of the bridge of the nose.
- The *orbits* are formed by the left and right lachrymal.
- The *vomer* is the bone that forms the nasal septum.
- The *palatine* bones form a portion of the nasal cavity and the posterior part of the roof of the mouth.
- The *zygomatic* bones form the left and right cheek bones



**Figure 1: The anterior surface of the sternum**

**Drawing is based on Gray, *The Sternum* (2000) [Online]**

### **The sternum**

The sternum is a flat bone with an elongated shape. It supports the clavicles at the top and it articulates on the sides with the first seven pairs of ribs. The sternum is divided into three parts:

- The *mandibrium* (*mandibrium sterni*) is quadrangular in form, with the thicker part at the top and the narrower part at the bottom.
- The *body* (*corpus sterni, gladiolus*) is a longer, narrower and thinner bone than the mandibrium, with the widest part closer to the end.
- The *xipoid process* (*xipoid appendix*) is the smallest of the three; it is thin and elongated and consists of cartilage in the younger person, which might ossify in the adult, usually after the age of 40.

### **The ribs**

The ribs form a very large part of the thoracic skeleton. There are twelve ribs on each side. The first to the seventh rib connect at the back with the vertebral column and in the front with the sternum. These are referred to as the true or vertebro-sternal ribs. The five ribs that remain are referred to as the false ribs. The first to the third connect with cartilage to the rib above, (vertebro-condral) and the fourth and fifth are free at the anterior. These are called the floating ribs. The spaces between the ribs are called the intercostals.

## **The vertebral column**

The vertebral column, also known as the spinal column or backbone, consists of 33 irregular shaped bones. These bones are divided into five categories:

- The *cervical vertebrae* are vertebrae 1 through 7. They are situated at the top of the spinal column and their function is to support the head and form a flexible framework for the neck. The first two cervical vertebrae form the atlas (this allows the head to move up and down) and the axis (this allows the head to move from side to side).
- The *thoracic vertebrae* are the next 12 vertebrae. The thoracic vertebrae form the posterior anchor column or wall of the rib cage and are larger in size than those of the cervical vertebrae.
- The *lumbar vertebrae* are the 5 largest vertebrae in the spinal column and their function is to support the person's weight.
- The *sacrum* is a bone with a triangular shape and forms the back wall of the pelvic girdle.
- The *coccyx* is the very last bone in the vertebral column.

## **The appendicular skeleton**

The appendicular skeleton is composed of bones that anchor the appendages to the axial skeleton.

## **The upper extremities**

The upper extremities of the skeletal system are formed by three parts:

- The *arm (brachium)* is the area from the shoulder to the elbow and consists of the humerus. The humerus is situated between the scapula at the shoulder and the ulna and radius at the elbow.
- The *forearm* is the area from the wrist to the elbow and consists of the ulna on the medial side and the radius on the lateral side. They both connect to the humerus at the elbow.
- The *hand* is made up of three distinct parts:
  - The *wrist (carpus)* consists of carpal bones that are bound together by ligaments;
  - The *palm (metacarpus)* consists of five metacarpal bones that are connected to the wrist bones and at the heads to the finger bones, which form the knuckles;
  - The *fingers (phalanges)* consist of fourteen bones in each hand that are in three rows: the proximal row, the middle row and the distal row. The thumb does not have a middle phalanx (finger bone).

### **The lower extremities**

Because the bones of the lower extremities of the body have to bear the weight of the person when in the anatomical upright position, they are the largest, strongest and heaviest of the skeletal system. The bones that form the lower extremities are:

- The *thigh (femur)*, this is the longest and strongest bone in the human body and is situated from the hip to the knee.

- The *leg* consists of two bones, the fibula and the tibia (also known as the shin bone) and they are situated between the knee and the ankle.
- The *foot (pes)*, is made up of 26 bones which form the ankle, the instep and the toes. The ankle (tarsus) consists of 7 bones and the largest tarsal bone is known as the calcaneus or the heel. The talus bone rests on the calcaneus and that in turn connects to the tibia. In front of the talus is a bone called the navicular bone. Other bones that remain are the medial, intermediate, lateral cuneiform bones and the cuboids.
- The *toes* are arranged in a similar manner to that of the fingers in the hand. Similar to the thumb in the hand, the big toe (hallux) does not have a middle bone.
- The *patella* (knee cap) is a large sesamoid bone between the femur and the tibia. The function of the patella is to protect the knee joint and the tendons that form the knee.

### **The shoulder girdle**

The shoulder girdle or pectoral girdle consists of four bones. These bones are the two clavicles (collar bones) and the two scapulas (shoulder blades). The clavicle is the bone that provides the connection between the sternum and the scapula. The scapula is a large triangular flat shaped bone that has a shallow depression called the glenoid cavity. This cavity provides a place for the humerus to fit into. The primary function of the scapula is to serve as an attachment point for the muscles that, in turn, allow the shoulder and

elbow joints to move. The secondary function of the scapula is to connect the upper extremities to the axial skeleton.

### **The pelvic girdle**

The function of the pelvic girdle is to:

- Support the weight of the body from the vertebral column
- Contain, protect and support the lower organs, including the urinary bladder and the reproductive organs

The pelvic girdle is formed by two coxal bones that meet in the posterior to either side of the sacrum. In the front they are connected by a muscle called the pubic symphysis.

### **Why the skeletal system is important to the singer**

The skeletal system is important to the singer in that it provides a central basis from which the singer can work.

The skull is the structure that to a large extent determines the vocal characteristics of the singer. It provides the singer with resonating cavities that aid in the amplification of the voice. Historical experience seems to indicate that singers with wider shaped cheekbones usually have more resonating capacity than those with a thinner shaped skull.

The facial bones, such as the jaw, help to create space when needed in the mouth for the correct shaping of vowels and consonants. They also aid the singer in creating enough space in the mouth to produce full-sounding high tones.

The nasal cavities and sinuses provide the resonant spaces that assist the singer to produce the volume required to project her voice over the sounds of the orchestra. The skill of attaining and maintaining resonance in these cavities is known by singers as “positioning” the voice in the front of the face. A great part of a singer’s training is dedicated to teaching a singer how to maintain this “focus” or “positioning” and how to keep the voice in the right position in the nasal cavity throughout the vocal range, which produces a consistent quality and volume of sound throughout the registers of the voice.

The sternum, the ribs, and the vertebral column of the skeletal system all provide the singer with the ability to breathe correctly, which is the singer’s fundamental source of “power” for the voice.

The upper and lower extremities are used in every movement the singer makes. The singer gestures, walks, runs and dances. These movements help the singer to create mood, show the personality of a character, express emotion and entertain the audience.

The skeletal system forms the very foundation that is used by the singer to create sound and to express herself in every performance.

## **The muscular system**

Information condensed from Wikipedia, *Muscle* (2006) [Online].

### **Overview**

The muscular system has various characteristics and functions in the body. These characteristics are:

- Excitability, which enables the muscle to respond to stimuli.
- Contractibility, which enables the muscle to shorten in length.
- Extensibility, which enables the muscle to stretch whenever it is pulled.

The functions of the muscles are:

- To provide motion
- To maintain the body's posture
- To aid in the production of heat for the body.

### **The muscle types**

There are various types of muscle in the body, and they are divided into three categories – skeletal muscle, smooth muscle, and cardiac muscle.

#### **Skeletal muscle**

The function of skeletal muscle is to attach the bones of the skeleton to each other with tendons. The entire muscle is surrounded by a sheath called epimysium. Skeletal muscle is voluntary muscle, which consists of subunits called fascicles. Fascicles are composed of muscle fibre cells. The muscle fibre cells have myofibrils which are made up of protein

molecules. Impulses travel along the muscle cell membranes and, as in the case of muscle function, they bring about contraction. An example of a skeletal muscle is the biceps.

### **Smooth muscle**

The smooth type of muscle is involuntary. These are the muscles of the viscera (for example, the intestines). It has spindle shaped cells that are arranged in sheets and the cells in the smooth muscle are made up of thick and thin myofilaments. There are two types of smooth muscle:

- *Visceral* smooth muscle

These are found in the walls of hollow organs, for instance, in the reproductive system.

- *Multiunit* smooth muscle

These muscles consist of motor units which are activated by nervous stimulation. Multiunit muscles are found in the walls of large blood vessels in the eye and at the base of the hair follicle.

Some of the functions of smooth muscle are to regulate the flow of the blood in the arteries, to move the food along through the gastrointestinal tract, to expel urine from the bladder, to assist in the birth of a baby from the uterus, and to regulate the flow of air through the lungs.

### **Cardiac muscle**

This is the third type of muscle. It is the muscle of the heart and it is involuntary. The cardiac muscle resembles skeletal muscle, as it is also

striated and the cells contain sarcomeres with sliding filaments of actin and myosin. The myofibrils of each cell are branched and in turn these branches interlock with those of adjacent fibres by adherence junctions. These junctions allow the forceful contraction of the heart muscle without ripping the fibres apart. Cardiac muscle has a richer supply of mitochondria than the skeletal muscle. It has little glycogen, with the result that an interruption of the flow of oxygen to the heart can cause a heart attack (Kimball, *Cardiac Muscle* (2006) [Online]).

Muscles are present all over the body, but we shall focus on the function of those muscles that assist the singer in voice production and the ability to give a professional stage performance.

### **The head and neck muscles**

There are a large number of muscles that exist in the head and neck that assist the singer to move her head, swallow, and to produce sound. The primary muscles are:

- The *digastric* muscle, which is on the under side of the jaw. Its function is to assist the mylohyoid and the geniohyoid muscles to move the hyoid bone and the tongue up and forward, as well as up and back when swallowing and producing sound.
- The *hyoglossus* muscle, which is thin and flat and is situated on either side of the tongue. It originates from the side of the hyoid bone in the throat and vertically inserts into the tongue. When these two muscles contract, the tongue is flattened and the sides of the tongue are turned down.

- The *omohyoid* muscle, which is in the shape of two large triangles on each side of the neck and is united by one tendon. The function of this muscle is to move the hyoid bone backwards and from side to side, it also assists in swallowing, speech and chewing.
- The *sternohyoid* muscle, which is a narrow, ribbon thin muscle in the front of the neck. Its function is to pull down the hyoid bone during swallowing and to assist in flexing the head and neck.
- The *stylohyoid* muscle, which is a thin and slender muscle that raises the hyoid bone and the base of the tongue when swallowing.
- The *thyrohyoid* muscle, which originates from the thyroid cartilage and ends at the hyoid bone. Its function is to elevate the thyroid cartilage.
- The *inferior pharyngeal* muscle, which stretches from the thyroid to the pharynx and helps to move the food down the oesophagus when swallowing.
- The *middle pharyngeal* muscle, which is a flat fan shaped muscle that assists in moving food down through the oesophagus when swallowing.
- The *masseter* muscle, which is at the side of the jaw. It is one of the muscles used in chewing and talking.
- The *platysma* muscle, which is a broad thin sheet of muscle and its function is to draw the lower lips and the corners of the mouth sideways and down. This muscle also increases the diameter of the neck when breathing is intense.
- The *rectus capitis* muscle, which is a small triangular muscle that has the function of tilting the head back and rotating it from side to side.

- The *semispinalis capitis* muscle, which lies deep in the back of the neck and its function is to extend the head and to rotate it.
- The *splenius capitis* muscle, which is at the back of the neck, joining the skull and the spine. Its function is to rotate and tilt the head from side to side.
- The *trapezius* muscle, which is one of the biggest shoulder muscles on the back of the neck and the upper trunk. It is a broad, flat, triangular muscle and is situated just below the skin. The trapezius links the neck with the spine, ribs and the scapula and functions in tilting and turning the head, raising and twisting the arms, or shrugging the shoulders.

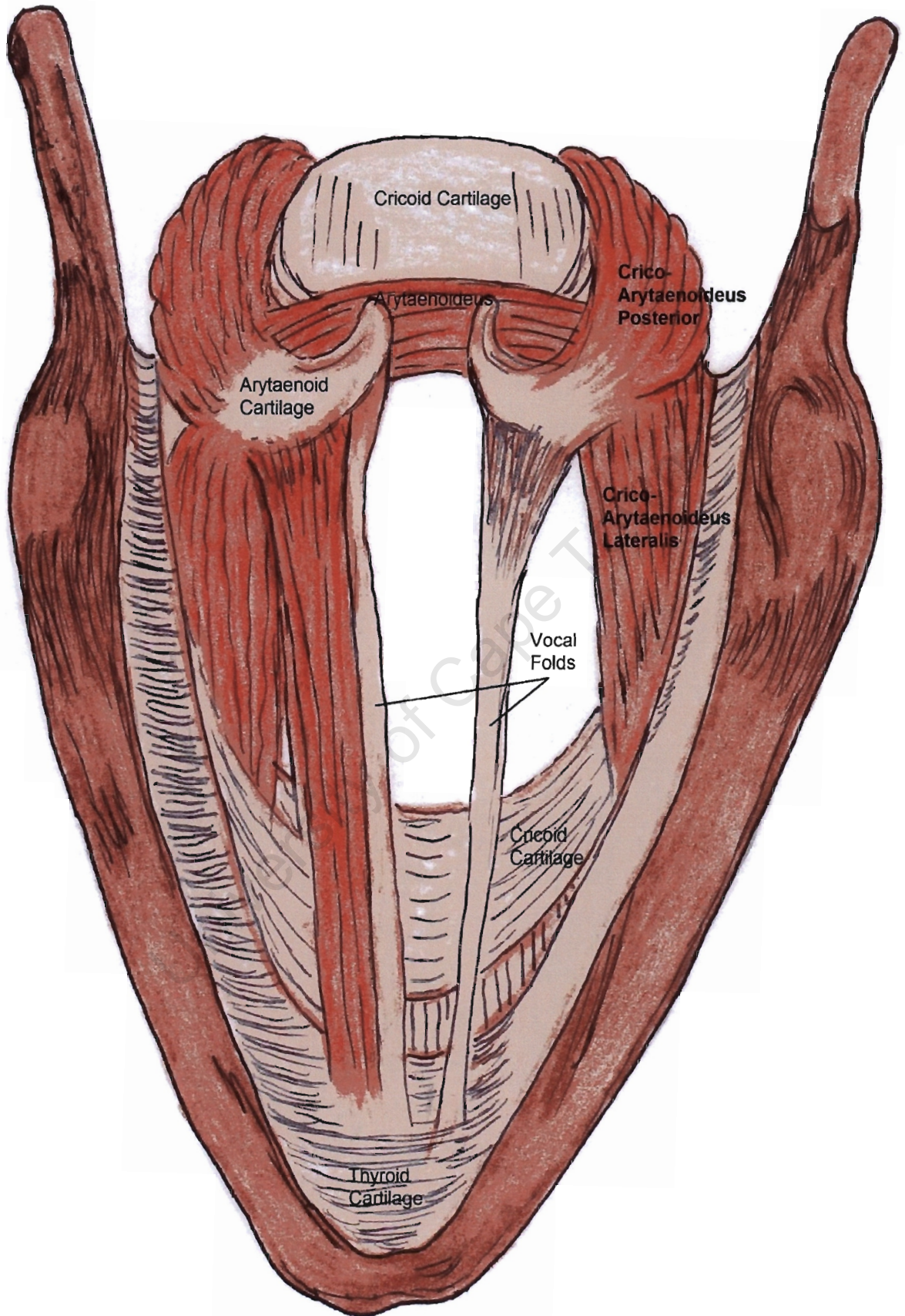
### **The muscles of the larynx**

The muscles of the larynx consist of muscles that change the opening of the glottis and muscles that have an effect on the tenseness of the vocal folds, so that we can vocalize. Some of the major muscles in the larynx are:

- The *cricothyroid* muscle, which is situated anterior and external to the larynx. When it contracts, it pulls the thyroid cartilage forward and tenses the vocal folds by lengthening them.
- The *crico-arytaenoideus lateralis* muscle, which arises from the upper border of the cricoid cartilage and inserts into the muscular process of the arytenoids cartilage.
- The *arytaenoideus transverses* (*transverse arytenoideus* muscle), which lies between the two arytenoid cartilages; its function is to pull the arytenoids together when they contract.

- The *crico-arytenoideus posterior* muscle, which extend from the expanse of the cricoid lamina and insert into the muscular process of the arytenoid cartilages. These are the only muscles that open the space between the vocal folds.
- The *thyreoarytaenoideus* muscles, which are positioned from the back of the thyroid cartilage to the front of the arytenoids cartilage. Their function is to pull the arytenoids cartilage forward when it contracts, loosening the vocal ligament. The deep upper part of this muscle is the vocalis muscle and this can change the tenseness of small segments of the vocal folds in order to vary tonal qualities of the voice.

To summarize, the muscles of the larynx are used to keep the airways open and to aid in vocalizing.

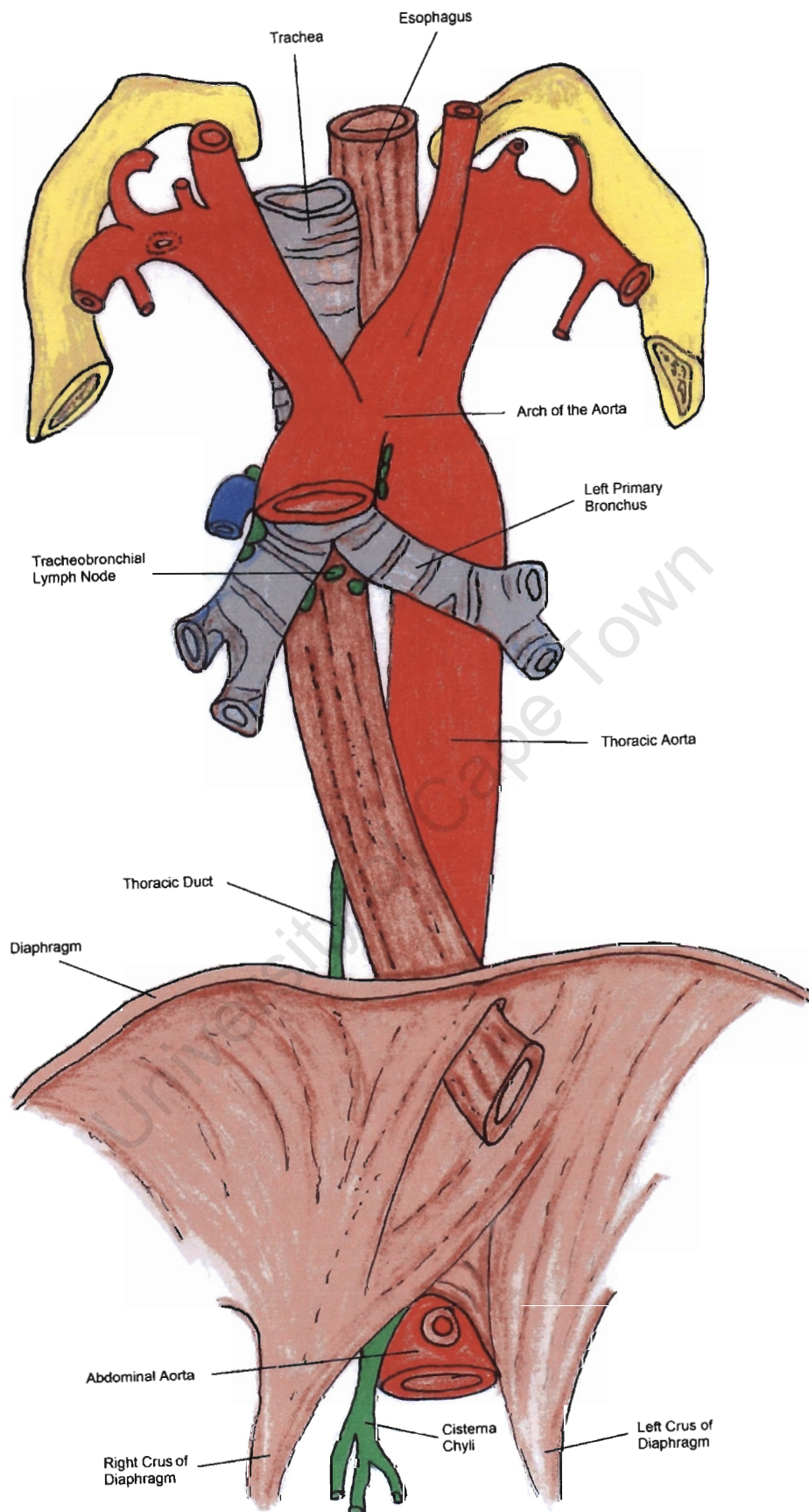


**Figure 2: The muscles of the larynx, seen from above**

**Drawing is based on Gray, *The Larynx* (2000) [Online]**

## **The diaphragm and muscles of the thorax**

The chest is known as the thorax and the lungs are situated in the thoracic cage (see respiratory system). This is a rigid structure and has the diaphragm as its floor, which in contrast to the thoracic cage, is very flexible and divides the abdominal and thoracic cavities. The muscles of the thorax support and protect the body. A primary function for the thoracic muscles is to assist the singer in the breathing process and in breath control, both of which are essential to the singer. When we breathe the size of the thoracic cavity increases from front to back and side to side as the external intercostal muscles (muscles between the ribs) contract. When the aspiratory muscles contract they increase the volume of the thoracic cavity, causing the air from outside to enter the lungs. As the aspiratory muscles relax the thoracic cavity goes back to its normal size. This causes the air to flow out of the lungs and exit the body through the mouth and nose. While the aspiratory muscles are working to aid the body in inhaling and exhaling, the abdominal contents get pushed up against the underside of the diaphragm. This causes the diaphragm to become even more dome shaped, with the result that the thoracic cavity becomes smaller. As the diaphragm, the primary muscle in respiration, contracts, it pulls downwards towards the abdomen. The lungs fill with air, and the abdomen protrudes, this is called abdominal breathing, and is usually the primary breathing method of the singer (INTELLIMED International, *Diaphragm* [Online]).



**Figure 3: The diaphragm**

**Drawing is based on Agur (2005: 72)**

## **The muscles of the upper and lower extremities**

The muscles of the upper and lower extremities are referred to as the prime movers of the body. They enable the body to move and are called agonists.

- *The upper arms*

These muscles include the biceps brachii, the brachialis and the triceps brachii.

- *The lower arms*

These muscles include the brachioradialis, the flexor carpi radialis, the digitorum superficialis, the flexor carpi ulnaris and the extensor carpi ulnaris.

- *The upper legs*

These muscles include the sartorius, the rectus femoris, the fasciae latae, the vastus lateralis, the gluteus maximus, the adductor magnus and the semimembranosus.

- *The lower legs*

These muscles include the tibialis, the flexor digitorum longus, the soleus, and the gastrocnemius.

Muscles that oppose the movement of the agonists are called the antagonists.

These are any muscles that extend a limb, acting against the muscle that flexes or bends. Stabilizer muscle holds the bone or part of the body in a steady position, so that the other muscles can pull. Leg and arm muscles work like levers; we see this at the shoulders, the elbows, the ankles, hips and the wrists. The muscles of the legs and arms synchronize movement of the upper and lower extremities and they make sure that the balance of the body is kept so that it does not fall over.

## **The muscles of the back**

Information condensed from Norman, *Intermediate and Deep Muscle* (1999) [Online].

The muscles of the back are made up of the intermediate and deep muscle layers of the back.

- *The intermediate layer*

The superficial layer of the muscles of the back is made up of the trapezius, the latissimus dorsi, the rhomboid major, the rhomboid minor and the levator scapulae. When these muscles are reflected, the intermediate layer of muscles can be observed, which consist of two muscles, the serratus posterior superior and the serratus posterior inferior, that act on the ribs.

- *The deep layer*

The deep muscle layers of the back, the intrinsic muscles, keep the body erect while the body is awake, whether in the standing or seated position. The strongest muscles in the back are the erector spinae group of muscles, which consists of the iliocostalis, the longissimus and the spinalis.

## **The abdominal muscles**

There are four muscle groups that make up the abdominal muscles and their function is to protect the internal organs, support the trunk, allow movement, and to keep the organs in place by regulating the abdominal pressure.

The four abdominal muscle groups are:

- *Transversus abdominus*

This muscle group is the deepest layer of the abdominal muscle groups and the primary functions are to stabilize the trunk and to maintain internal abdominal pressure.

- *Rectus abdominus*

The rectus abdominus is situated between the ribs and the pubic bone at the front of the pelvis. The function of this muscle group is to provide movement for the body between the ribcage and the pelvis.

- *External oblique*

The external oblique muscles flank the rectus abdominus muscle group. The main function of these muscles is to enable the trunk of the body to twist.

- *Internal oblique*

The internal oblique muscles also flank the rectus abdominus muscle group. This muscle group is positioned inside the pelvis and it works the opposite way to the external oblique muscle group.

### **The pelvic muscles**

The muscles in the pelvis can be divided into two groups, the first group being the muscles of the lower limb, which originate in the pelvis and form part of the pelvic wall (obturator internus and the piriformis), and the second group, the levator ani and the coccygeus, which form most of the pelvic floor:

- *The pelvic diaphragm (floor)*

The pelvic diaphragm stretches across the floor of the pelvic cavity and supports the abdominal viscera and pelvic viscera.

- *Levator ani*

The levator ani is a broad thin muscle and forms most of the pelvis floor. It consists of two parts, the pubococcygeus and the iliococcygeus:

- *Pubococcygeus*

The pubococcygeus stretches from the dorsal surface of the pubis and openings between the muscles forms the passages of the vagina, the anal canal and the urethra.

- *Iliococcygeus*

The iliococcygeus is situated posterior to the levator ani and it stretches from the spine of the ischium and the sacrospinous ligament and inserts into the coccyx and the sacrum. These muscles also function as a help to the levator ani.

In the pelvic floor muscles there are muscular bands (sphincters) that form circles around the urethra, the vagina and the anus. When the pelvic muscles contract, the internal organs move upwards. The sphincters tighten around the urethra, vagina and the anus, closing the openings. However, when the muscles of the pelvic floor are relaxed they allow the passing of urine and faeces.

### **Why the muscular system is important to the singer**

The muscular system is extremely important to the singer. The singer uses the facial muscles, the head muscles and the neck muscles to assist in the forming of sounds. The tongue is constantly moved when words are formed and the position of the tongue is extremely important in the creating the vowels. The tongue

position changes for every vowel sound. The classical singer receives extensive training in the correct usage of the tongue to aid in forming sound and creating space in the mouth. If the tongue position is incorrect, it can obstruct the sound and make it less pleasant to listen to. By lowering the tongue and lifting the soft palate, more space is created; this space is required to resonate sound and form higher tones.

The thorax muscles, the back muscles and the pelvic muscles are used extensively in breathing and in supporting the sound that is created by the singer.

The abdominal muscles are also used to breathe with and to support the sound. The most important muscle to the singer is the diaphragm. The diaphragm is the basis of good breathing technique and, as mentioned before, breathing is the power source for the singer.

The muscles of the upper and lower extremities are used to assist the singer to maintain a good stance, to sustain the singer's balance, and to allow all the various movements that the singer needs to make, such as sitting, walking, dancing and gesturing. It is essential that the singer's body is well balanced while moving and singing. Incorrect posture and a lack of balance may result in the singer delivering a performance of poor quality, with unsupported tone and a body that is unattractive to look at on the stage.

## **The endocrine system**

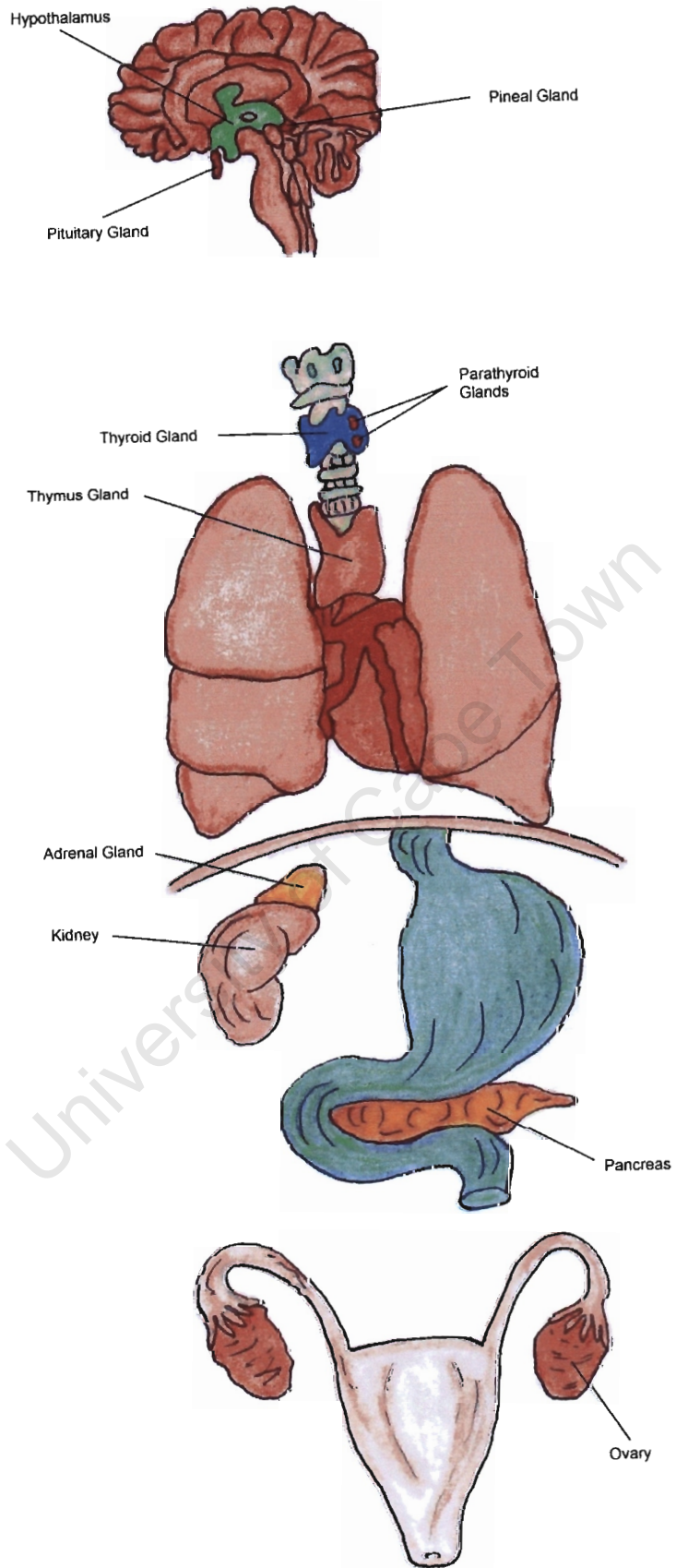
Information condensed from INTELLIMED International, Endocrine System [Online].

### **Overview**

Hormones are secreted into the blood by endocrine glands, which help to regulate the metabolic processes of the body. There are numerous glands that contribute to this function but for our purposes we shall only look at those that are relevant, namely:

- The *parathyroid* gland
- The *hypothalamus* and *pituitary* gland
- The *thyroid* gland
- The *adrenal* gland

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**Figure 4: The endocrine glands**

Drawing is based on Alcamo, *Anatomy* (2003: 153)

### **The parathyroid gland**

The parathyroid glands are situated on the posterior aspect of the thyroid gland. The main hormone of this gland, the parathormone, raises the calcium level of the body fluids and stimulates the release of calcium from the bones. Calcium is essential for muscle function, nerve activity, bone metabolism, and the well being of cells.

### **The hypothalamus and pituitary gland**

The pituitary gland is located at the base of the brain and is also known as the hypophysis. This gland is connected to the brain by a stalk called the infundibulum.

The infundibulum connects a portion of the pituitary gland to a region of the brain known as the hypothalamus. The anterior lobe of the hypothalamus produces numerous hormones, one of which is the hormone prolactin, which is the stimulator for the production of milk in the mammary glands.

The FSH (follicle-stimulating hormone) and LH (luteinizing hormone), responsible for the stimulation of the rise of oestrogen and progesterone during the monthly menstrual cycle, are also produced here.

Other hormones that are produced in the hypothalamus are noradrenalin, dopamine and serotonin. These hormones regulate our mood and have a profound effect on the psychological health of the female, especially during her menopause.

## **The thyroid gland**

Information condensed from Corio, *The change* (2000: 324).

The thyroid gland is situated around the windpipe between the larynx and the collarbone at the base of the neck. It has the shape of a butterfly. It receives its blood supply from two arteries, the superior thyroid artery, and the inferior thyroid artery. The function of the thyroid hormone is to stimulate the metabolic rate in cells and to promote growth; therefore it has an enormous effect on the body. If the thyroid is not working as it should, the body will either lose or gain weight, the body will change temperature frequently, the person will have problems sleeping (insomnia) or be exhausted all the time and there will be a loss in bone mass. The thyroid uses two hormones to regulate the metabolism of the body. These hormones each contain three or four atoms of iodine respectively, and are referred to as T3 and T4. Our thyroid produces ten times more T4 than T3, but once these are in circulation, the T4 is converted to T3. In order for the body to know how much T3 and T4 is needed, the hypothalamus and pituitary glands in the brain regulate these functions. The hypothalamus secretes the thyrotropin-releasing hormone (TRH). This in turn stimulates the pituitary gland to release the thyroid-stimulating hormone (TSH), which then stimulates the thyroid to release T3 and T4. If the levels of T3 and T4 are too high it will cause the hypothalamus to secrete less TRH and therefore the pituitary gland will be less sensitive to TRH. The TSH levels will be lower then and this could cause the thyroid to slow down the production of T3 and T4.

Like the thyroid gland, the ovaries are controlled by the hypothalamus and the pituitary glands. The ovaries have receptors for the thyroid hormones and the

thyroid has receptors for oestrogen and progesterone, the hormones secreted by the ovaries. The thyroid hormones also regulate the levels of serotonin in the brain. Serotonin assists in keeping our mood even, enhances libido and helps with memory. If the levels of serotonin are affected, symptoms such as moodiness, lack of libido and memory loss may be present. These symptoms can also be a sign of a thyroid that is not functioning properly.

### **The adrenal glands**

Adrenal glands are triangular shaped glands that are positioned on top of each kidney. The outer layer, called the adrenal cortex produces various hormones. These hormones include cortisol, DHEA, oestrogen and testosterone. Adrenaline is produced in the centre of the gland. The function of the adrenal glands is to increase the production of adrenaline and other hormones when the body experiences danger. This increases the heart rate and blood pressure, sharpens the senses, releases energy that the body has stored and slows the digestion. This is known as a healthy stress response and it takes priority over all other metabolic functions in the body (Holmes, *Adrenal Fatigue* [Online]).

### **Why the endocrine system is important to the singer**

The endocrine system is a very important system for the singer as it regulates many areas in which the body functions. The singer's metabolism is regulated by it and a healthy metabolism will result in a healthy body, which will not be overweight and sluggish. The calcium and the muscle function that is influenced by the release from the parathyroid gland provides the singer with a healthy skeleton and strong muscles, which is already known to be absolutely essential to

the singer as skeleton and muscles assist the singer to breath and aid in the support of the voice.

The sufficient production of oestrogen and progesterone is important to the singer's bone health, monthly cycles, and to maintain a healthy emotional balance.

The healthy release of adrenalin is very important to the singer, as it keeps the singer focussed on what is happening on the stage. It also allows the singer to respond swiftly to what is going on around her and adds an exciting level of energy to the performance.

The release of serotonin in the brain also promotes emotional stability. The latter not only helps the singer to give a performance that has a high energy level but also helps her to concentrate and give a tightly co-ordinated performance - a performance which will project professionalism and be a joy to the audience.

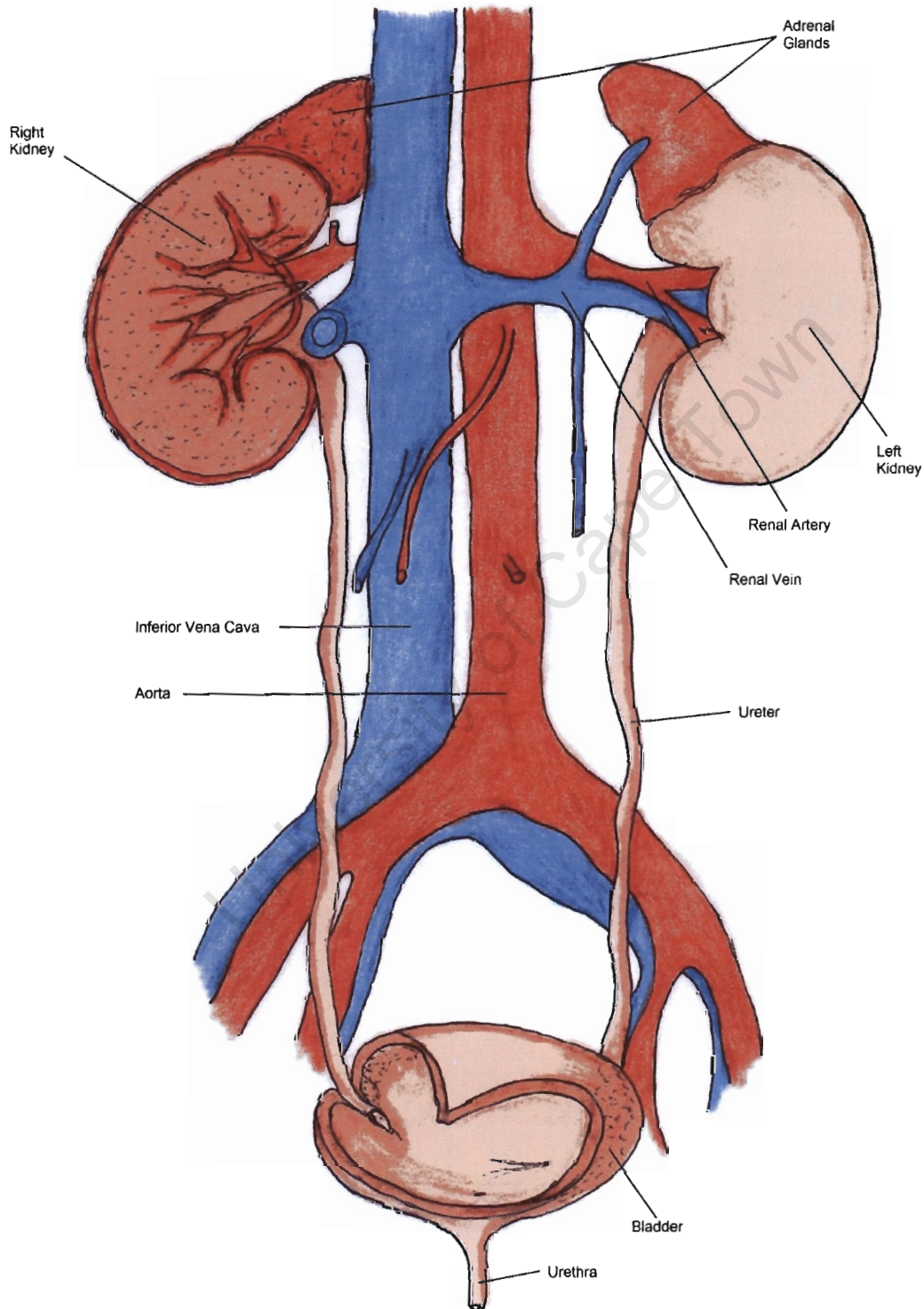
## **The urinary system**

Information condensed from United States National Institute of Diabetes, *Your Urinary System* (2004) [Online].

### **Overview**

The urinary system consists of two kidneys, two ureters, the bladder, two sphincter muscles and the urethra. The urinary system works together with the lungs, the skin and the intestines to secrete wastes and to keep the chemicals and water balanced in the body.

A type of waste, called the urea, is removed by the urinary system from the blood. When a person consumes foods that contain protein, this gets broken down in the body and is carried to the kidneys via the bloodstream.



**Figure 5: The urinary system**

**Drawing is based on Agur (2005: 158, 175)**

### **The kidneys**

The kidneys are organs that are approximately the size of the fist and have the shape of a bean. They are situated below the thorax on either side of the posterior midline behind the peritoneal membrane that lines the abdominal cavity and beneath the groin area of the back. The function of the kidneys is to remove urea from the blood via small filtering units, known as the nephrons. The nephrons consist of glomerulus (small blood capillaries) and a tube that is known as the renal tubule. Urine is formed by various waste substances, mostly water and urea; this filters through the nephrons and down the renal tubule of the kidney. As urine leaves the kidney, it moves through the ureters (tubes) and into the bladder.

### **The ureters**

The ureters are approximately 22cm in length and their function is to constantly move the urine away from the kidneys and empty it into the bladder.

### **The bladder**

The bladder is balloon-shaped and is situated in the pelvis. The function of the bladder is to store urine until the body is ready to get rid of it.

### **The sphincters**

The sphincters are muscles that prevent the bladder from leaking and are situated around the opening of the bladder into the urethra. The urethra is the tube that urine passes through when it leaves the body.

### **Why the urinary system is important to the singer**

The urinary system is important to the female singer because she depends very much on the healthy functioning of the bladder, the kidneys, the urethra, the ureters and the sphincters. Her performing would be difficult, if not impossible, if any of these organs stopped functioning. Some women experience considerable problems with the urinary system during menopause. The effects of menopause on the urinary system and the treatments available to the singer will be discussed in a later chapter dealing with the various symptoms of menopause.

### **The respiratory system**

Information condensed from American Lung Association, *Human Respiratory* (2005) [Online].

#### **Overview**

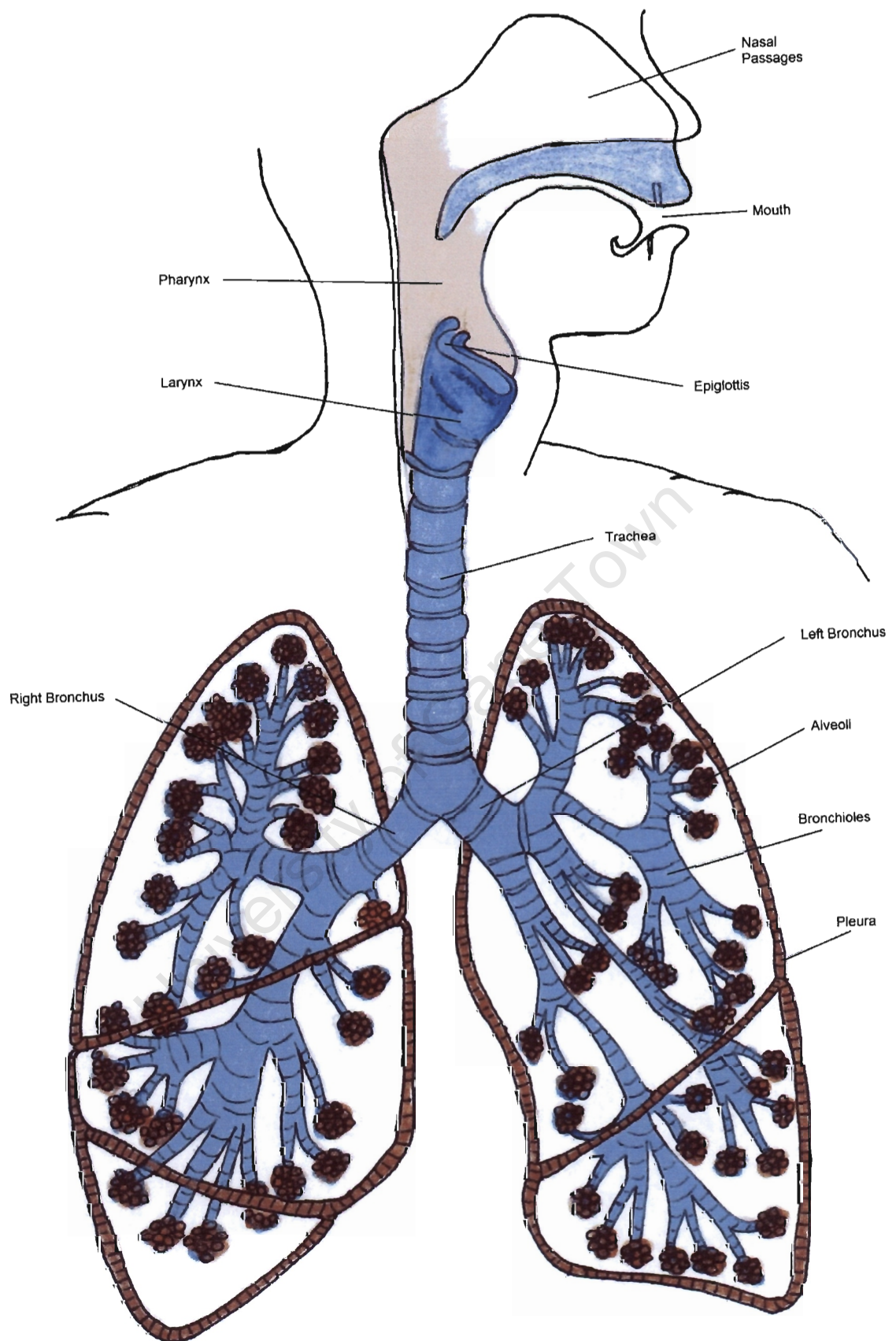
The human respiratory system is made up of the airways, the lungs and the respiratory muscles. Together they allow the movement of air into and out of the body. The respiratory system fills the blood with oxygen and removes the waste carbon dioxide gas from the blood. There are two zones in the respiratory system, the conducting zone and the respiratory zone.

The components of the respiratory system are (Wikipedia, *Respiratory system* [Online]):

- The *nose*
- The *mouth*
- The *nasal cavity*

- The *sinuses*
- The *pharynx*
- The *larynx*
- The *trachea*
- The *left and right bronchus*
- The *bronchioles*
- The *terminal bronchioles*
- The *alveoli*
- The *alveolar ducts*

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**Figure 6: The respiratory system**

**Drawing is based on Kimball, *The Human Respiratory System* [Online]**

## **The nose**

When we inhale, air enters the body through our nose and mouth. The surfaces of the mucus membranes of the nasal cavity and sinuses are lined with cilia. These membranes warm up the air as it is inhaled and provide a protective mechanism, by trapping irritants at inhalation so that they do not enter the respiratory tract.

The nose is divided into a left and right side by the septum and this forms the centre of the nose. It is made up of cartilage in the front and bone at the back. On the side walls of the nose there are bones called turbinates, which are classified into three categories:

- *The lower turbinate* - the area where the tear duct from the eye drains into.
- *The middle turbinate* - the area where the maxillary and ethmoid sinuses drain into.
- *The superior turbinate* - the area where the drainage of the ethmoid and sphenoid sinuses occur into the nose.

## **The mouth**

The mouth aids the nose when inhalation takes place and helps to humidify the air as it enters the lungs.

## **The nasal cavity**

The nasal cavity is lined with cilia. The cilia move in a sweeping motion to move the mucus and the trapped particles in the mucus out of the sinuses and back into the nose.

## The sinuses

The sinuses are cavities that exist in various bones of the skull. They are lined with mucus membrane and are filled with air. They are situated next to the nose on either side and connect to the nose via an opening called the ostium.

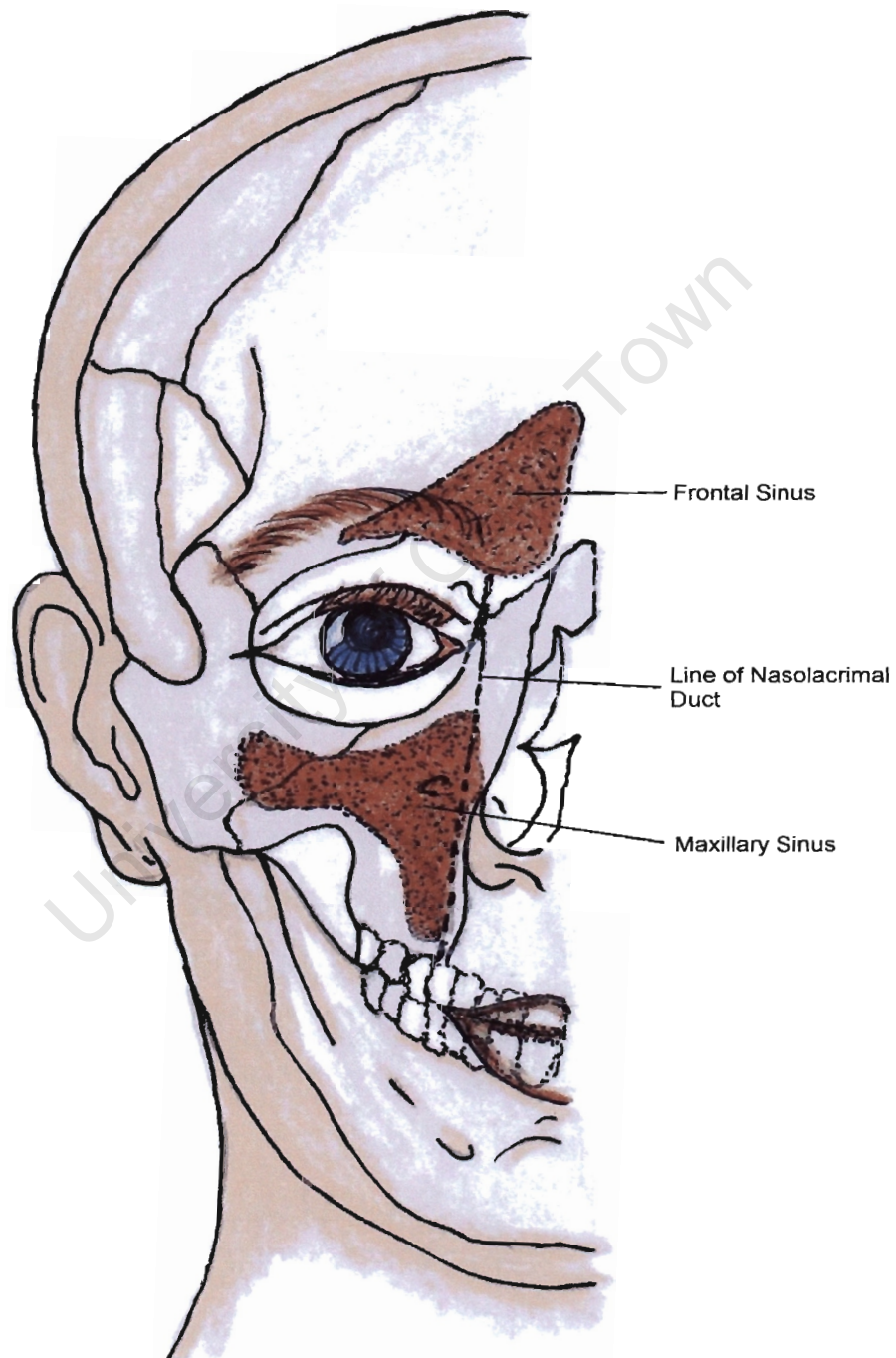


Figure 7: The sinuses

Drawing is based on Gray, *Fig. 1199* (2000) [Online]

The sinus cavities can be divided into four types:

- The *frontal* sinus in the forehead.
- The *sphenoid* sinus, situated behind the eyes.
- The *ethmoid* sinus on each side of the nose, between the eyes.
- The *maxillary* sinus below the eyes, situated in the cheek bone.

### **The pharynx**

The pharynx consists of three parts:

- The *nasopharynx* - the part of the pharynx that continues with the nasal cavity.
- The *oropharynx* - the area between the soft palate and the tongue.
- The *laryngopharynx* - the area at the opening to the oesophagus and the trachea.

### **The larynx**

The larynx (voice box) houses the vocal folds (vocal cords) and is the most important part of the body for the production of a vocal sound. It is situated on the top of the trachea (windpipe) and below the pharynx.

The main framework of the larynx consists of three single and three paired cartilages. The single cartilages are the:

- The *epiglottis*

The epiglottis extends up behind the tongue and it connects to the thyroid cartilage beneath the thyroid notch.

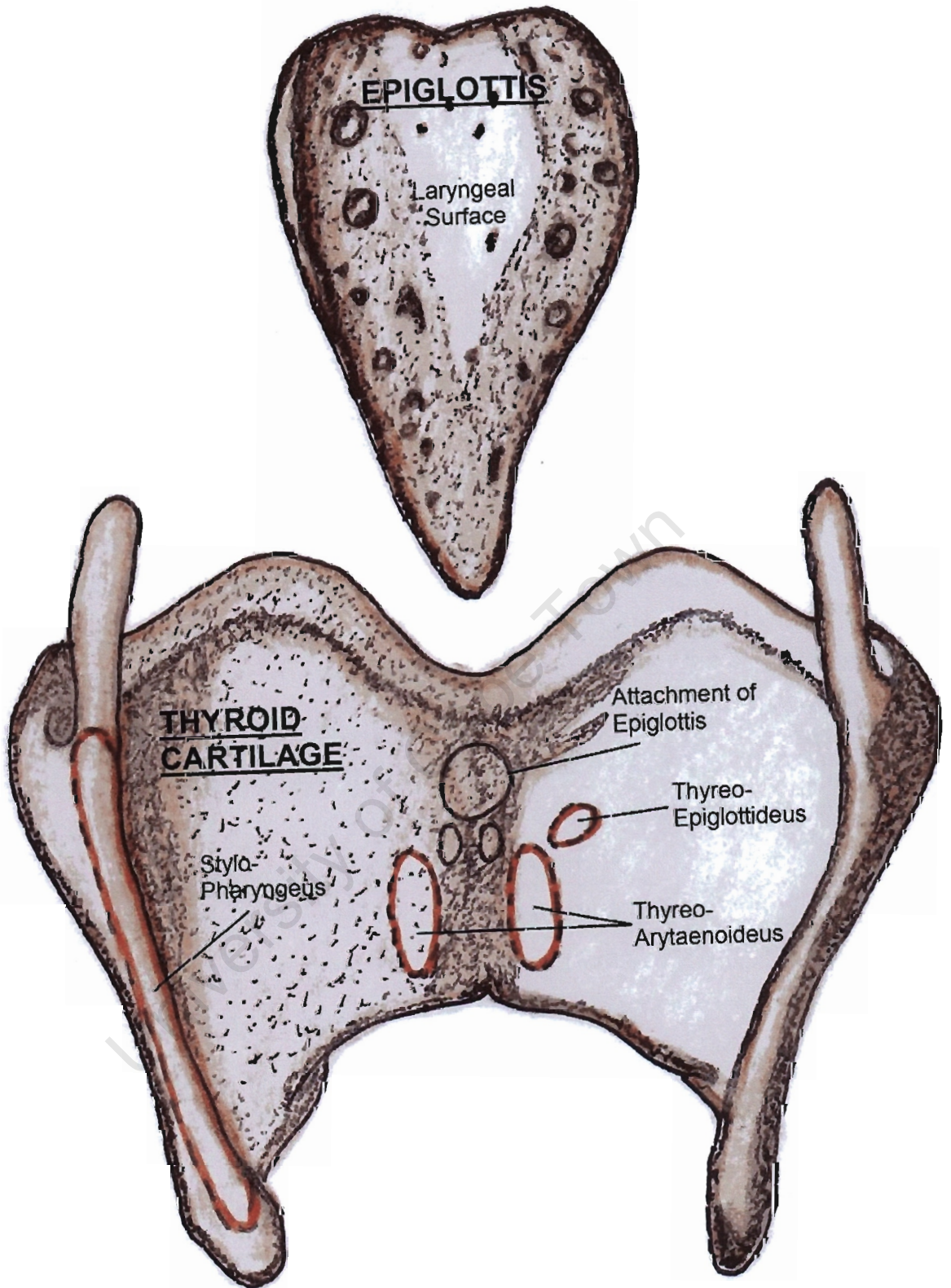
- The *thyroid cartilage*

The thyroid cartilage rests on a cartilage in the shape of a ring, called the cricoid cartilage.

- The *cricoid cartilage*

The cricoid cartilage connects the larynx to the trachea. It is shaped narrow in the front and broader at the back.

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**Figure 8: The cartilages of the larynx**

Drawing is based on Gray, *The Larynx* [Online]

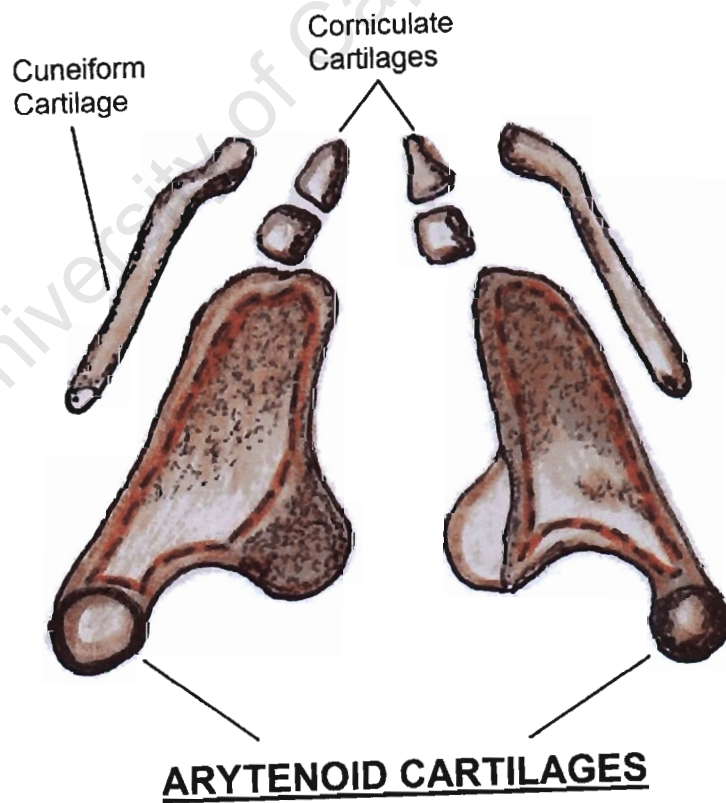
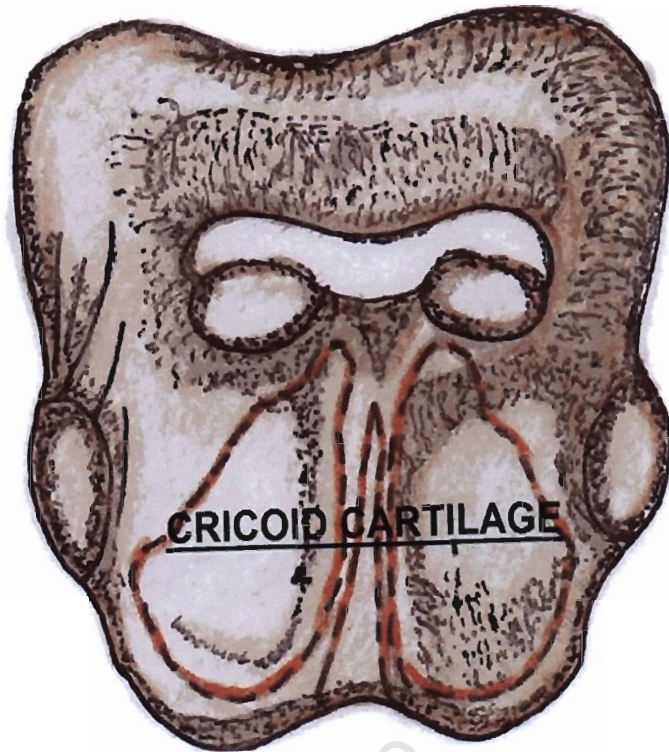


Figure 8 (continued): The cartilages of the larynx

Drawing is based on Gray, *The Larynx* [Online]

The paired cartilages are:

- The *arytenoids cartilages*

These attach to the vocal folds and support the muscles of the pharynx.

- The *corniculate cartilages*

These regulate the tension on the vocal folds.

- The *cuneiform cartilages*

These are situated between the epiglottis and the arytenoids cartilages and assist in the support of the soft tissue in this area.

The larynx is divided into three parts:

- The *glottic* part - the true vocal folds (vocal cords).
- The *subglottic* part - the area below the glottis.
- The *supraglottic* part - the structures above the vocal folds.

In order for the larynx to survive, it has to act as a sphincter. There are three sphincters within the larynx:

- The *true vocal folds*, which are thin slips of muscle in a ligament. They are covered by mucus membrane and are attached to the inside of the thyroid cartilage. When they are adducted, the airway closes completely and they act as a protector of the larynx as well as the lungs.
- The *false vocal folds* (ventricular folds), which look similar to the true folds. They are not “vocal”, but do have some muscle which allow them to contract and therefore protect the airway, especially the lungs.

- The *epiglottis*. This floppy cartilage is located in the throat behind the tongue and in front of the larynx. When swallowing takes place, the epiglottis tilts back and with the help of the aryepiglottic folds and the arytenoids, it closes off the top of the larynx. This allows the swallowed matter to move around the back of the larynx and end up in the oesophagus and, in this manner, prevents aspiration into the airways.

### **The trachea**

The trachea, or wind pipe as it is more commonly known, moves the air that we breathe into our lungs. It extends from the larynx to the bronchi and consists of incomplete cartilage rings, which reinforce the trachea so that it does not collapse when breathing takes place. These incomplete rings have open ends at the back, adjacent to the oesophagus and are connected by muscles with a mucous membrane lining the inside.

### **The left and right bronchus**

The left bronchus consists of two secondary bronchi and eight tertiary bronchi. The right bronchus has three secondary bronchi and ten tertiary bronchi. It is more vertical and wider than the left bronchus and approximately one inch shorter.

### **The bronchioles**

These are small airways that extend from the bronchi to the alveoli and are made up of muscle cells. They do not have any cartilage.

### **The terminal bronchioles**

Terminal bronchioles are the last few divisions of the bronchioles before it becomes adapted to respiration. There are approximately 70,000 in each lung.

### **The alveoli**

The alveoli are the final air sacs of the respiratory tree that acts as the primary gas exchange in the lungs. In chronic lung disease, including repeated asthma attacks, many of these delicate structures may be destroyed, leading to a condition known as emphysema, which could seriously impair the breathing of a singer.

### **The alveolar ducts**

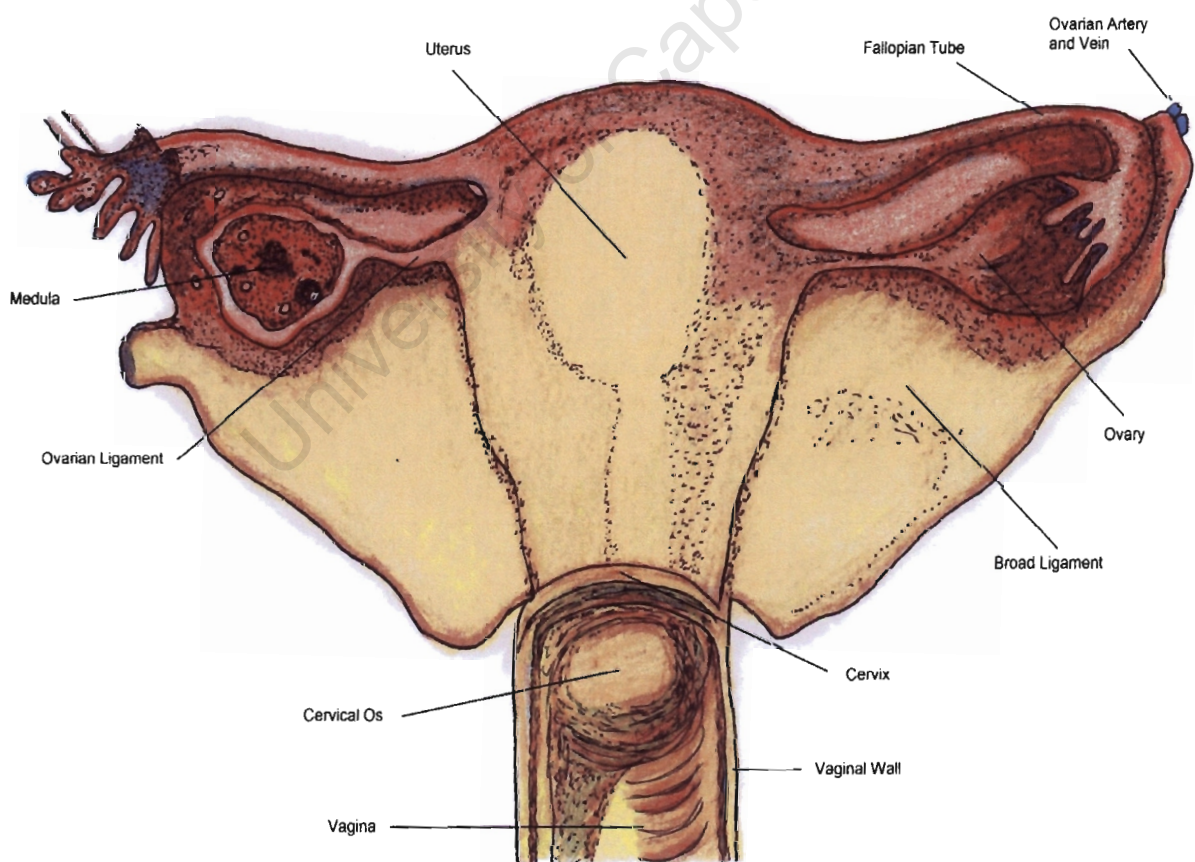
The alveolar ducts are tiny end tubes of the branching terminal bronchioles and each give rise to a cluster of alveoli or air sacs

### **Why the respiratory system is important to the singer**

The respiratory system is one of the most important systems in the body for the singer. Key issues in the art of singing are to breathe correctly and to use the breath to optimum effect. The singer inhales to a comfortable capacity of the lungs and then uses the diaphragm and abdominal muscles to control the amount of air that is exhaled at a slow pace, while the intercostals muscles and back muscles are used to keep the chest in an expanded position so that a note or phrase is held over a long period. The laryngeal mechanism (vocal folds, laryngeal cartilage, muscles and nerves) is the singer's instrument; it is here that musical sound is created, before being amplified in the space above the vocal folds, the space at the back of the throat, in the mouth, the nasal passage and in the sinus cavities.

The sinus cavities are very important to the singer. They are used as amplifying echo chambers for the voice. Singers dread any infection of the sinuses as this could affect their ability to perform and they may need to cancel performances as a result. Allergies sometimes cause a swelling of the lining of the nose and sinuses and may lead to much discomfort and pain. Other factors such as a deviated septum, which can cause an obstruction of the sinus openings, and a disorder of the turbinates, which can cause upper respiratory tract infections, are also problems the singer has to deal with from time to time.

### **The reproductive system**



**Figure 9: The reproductive system**

**Drawing is based on Davidson College, *Female Reproductive System* [Online]**

The female reproductive system consists of:

### **The ovaries**

The female body, and her voice, evolves from childhood to menopause due to the influences of various hormones, such as oestrogens, progesterone and testosterone. These hormones determine how the voice changes throughout life. During puberty, the release of oestrogens and progesterone produce the characteristics of the female voice (Wikipedia, *Ovary* (2006) [Online]).

### **Oestrogen**

Oestrogen is a female hormone that is produced in the ovaries, the adrenal glands, and in body fat and muscle. The better known oestrogens are estrone, estradiol, and estriol.

- **Estrone**

Estrone is the hormone that is measured to establish the levels of oestrogen still present in the body of women who have gone through menopause.

- **Estradiol**

Estradiol is the most common oestrogen present in non pregnant women. The level of estradiol drops to very low levels in menopausal women.

- **Estriol**

Estriol is the oestrogen that is produced by the placenta during pregnancy.

## **Progesterone**

This hormone is also produced in the ovaries and, together with oestrogen, it controls the growth of the uterus lining to prepare for the implantation and growth of an embryo, and causes an ovum in one of the ovaries to mature. The ovum is released (ovulation) and if pregnancy does not occur, the lining of the uterus as well as the ovum is discharged (menstruation).

## **The vagina**

The vagina is a muscular tube about 100mm long. It connects the vulva to the cervix. Vaginal lubrication is produced by glands near the opening of the vagina (Wikipedia, *Vagina* (2006) [Online]).

## **The cervix**

Information condensed from Wikipedia, *Cervix* (2006) [Online].

The cervix, also known as the neck of the uterus, is situated in the lower part of the uterus and joins up with the top part of the vagina. There are four parts to the cervix:

- The *ectocervix*

The ectocervix is the part of the cervix that projects into the vagina and is also known as the portio vaginalis. It is approximately 3cm long and 2.5cm wide. The ectocervix is divided into an anterior and a posterior lips.

- The *external os*

The opening of the ectocervix is called the external os. The size of this opening varies from woman to woman due to her hormonal state and whether she has given birth vaginally. The external os is normally covered

with thick mucus to prevent infection. However, when an ovum (egg) is ready to be fertilized, the mucus becomes thinner in order to allow the male sperm to pass through. During pregnancy, the external os is completely blocked with mucus in order to prevent infection.

- The *endocervical canal*

The endocervical canal is the passageway between the external os and the uterine cavity.

- The *internal os*

This is where the endocervical canal ends and the cervix opens into the uterine cavity.

The functions of the cervix are as follows:

- Childbirth

During childbirth the contractions of the uterus inside the uterine cavity dilate the cervix to approximately 10cm and this allows the child to be born.

- Menstruation

During menstruation, the cervix stretches open and allows the endometrium to be excreted through the vagina.

- Orgasm

During an orgasm the cervix convulses and dilates the external os.

### **The uterus**

The uterus is the major organ in the reproduction system. One end of it is connected to the fallopian tubes and the other end to the vagina. The uterus is

situated in the pelvis, dorsal to the bladder, and ventral to the rectum, and there are eight ligaments holding it in place. It consists of muscle called the myometrium and a lining which is known as the endometrium. It is this layer that builds up every month and prepares the uterus for a possible pregnancy. If fertilization does not take place, this build-up of lining gets shed through the vagina. This is known as menstruation and occurs approximately every 28 days in the human female. The surrounding tissue in the uterus is called the parametrium. The function of the uterus is to accept a fertilized ovum, which implants itself in the endometrium. The ovum develops into a foetus and stays in the uterus until the foetus has gestated to the time that childbirth takes place (Wikipedia, *Uterus* (2006) [Online]).

### **The fallopian tubes**

The fallopian tubes are the tubes that transport the ovum from the ovary to the uterus. This is accomplished by hair-like projections in the fallopian tubes called cilia which move the ovum along (Wikipedia, *Fallopian tube* (2006) [Online]).

### **Why the reproductive system is important to the singer**

The reproductive system is important to the singer because it influences her physical state on a daily basis. Starting as a young singer, she has to cope with menstruation, which can have a significant effect on the voice, and possibly later with a pregnancy. Due to several changes that may occur in the reproductive system, she might have to undergo surgery or deal with infections and will eventually pass through peri-menopause, menopause and post-menopause. All these different periods in the singer's life may cause her to have times when she

will not be able to perform and she will have to come to terms with this and adjust her singing career accordingly.

Every month with menstruation, hormonal changes may have a significant effect on the health of the singer. Premenstrual vocal syndrome may occur, which is characterised by vocal fatigue and a decrease in vocal range. This is mainly due to the swelling of the vocal folds (Armstrong. *Care of the Voice* [Online]).

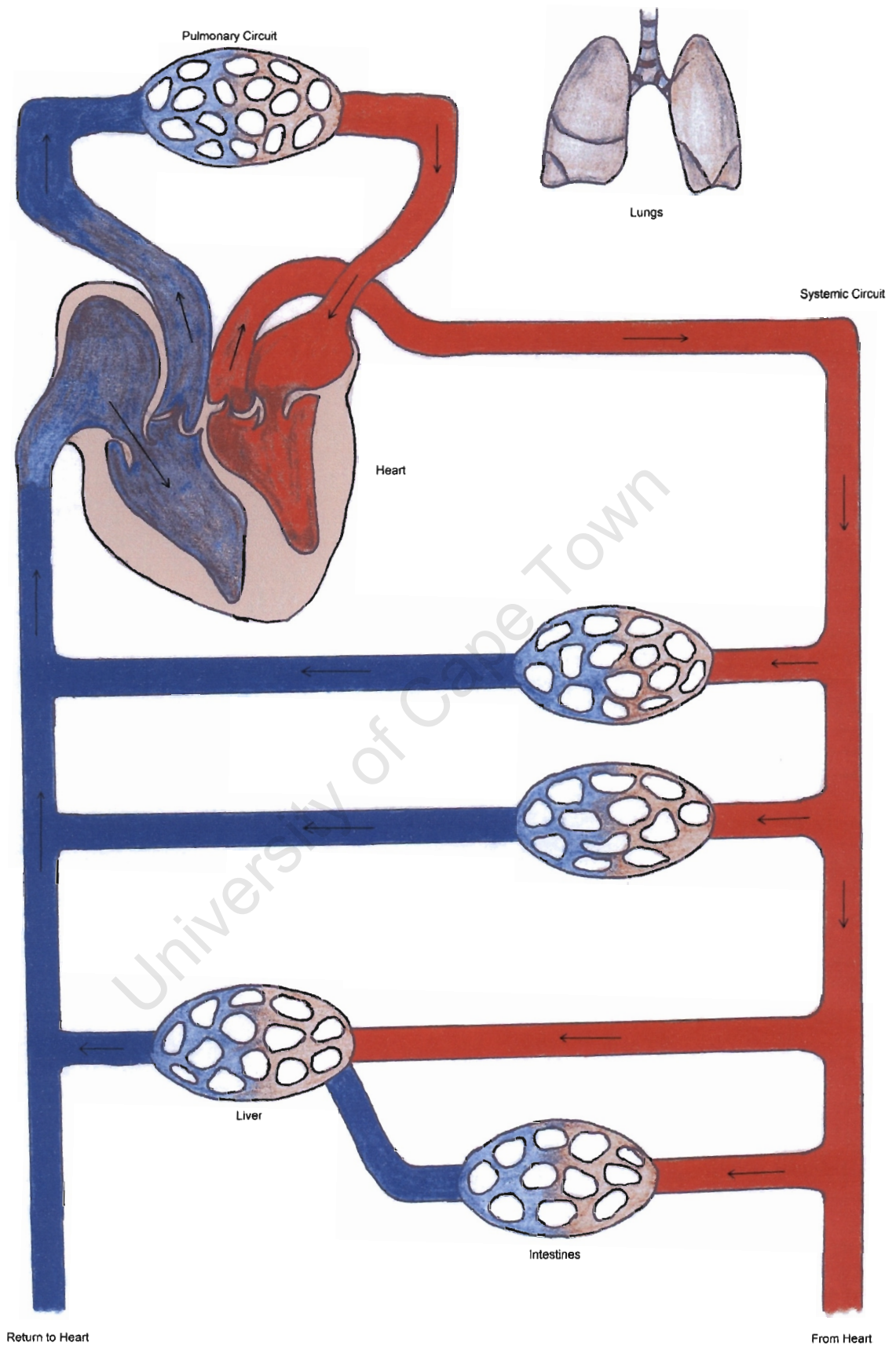
The reproductive system and the complications it may bring to the singer can potentially constitute some of the most profound problem areas in the life of the female singer.

## **The cardiovascular system**

Information condensed from Caldwell Community College, *Cardiovascular System* (2000) [Online].

### **Overview**

The cardiovascular system includes the heart and lungs as well as many blood vessels, which are known as the arteries, veins and the capillaries. These blood vessels transport oxygen into the blood stream and get rid of the carbon dioxide in the body.



**Figure 10: The cardiovascular system**

**Drawing is based on Virginia State University, *Circulatory System* [Online]**

## **The heart**

The heart is an extremely strong muscular pump, approximately the size of a fist. It is situated in the chest, has four chambers and is divided into a left and a right side. Pulmonary circulation takes part in the right side of the heart which delivers blood to and from the lungs. The pulmonary artery carries oxygen-“poor” blood from the right side of the heart to the lungs, where it then gets oxygenated and carbon dioxide gets removed. This oxygenated blood leaves the lungs via the pulmonary veins and enters the left side of the heart, from where the systemic circulation takes oxygen and provides blood to the rest of the body via the aorta and its branches.

## **The vascular system**

### **The arteries**

The aorta is the largest artery in the body and it consists of three main sections known as the arch of the aorta, the ascending aorta and the descending aorta. From these various sections arteries branch off to the head and the neck, the abdomen and internal organs, the extremities and the rest of the body. These arteries supply blood to the head, abdomen and the upper and lower extremities. The right and the left coronary arteries supply blood to the heart. Arteries branch off into arterioles.

### **The capillaries**

Capillaries are formed by arterioles that branch off into smaller vessels. The capillaries lie in a fluid produced by the lymphatic system and their

function is to be the point of exchange between blood and the surrounding tissue.

### **The veins**

Capillaries reunite to form small vessels known as venules, which in turn unite to form larger vessels known as veins. The function of veins is to return blood to the heart after the exchange of gases, nutrients, and waste has taken place. The blood in veins is oxygen “poor”, except in the pulmonary vein. The superior vena cava and the inferior vena cava collect blood from the whole body, with the exception of the lungs, and direct it back to the heart.

### **Why the cardiovascular system is important to the singer**

The cardiovascular system is probably the most important system of the body. The heart is essential for the body to exist. It is up to the individual to make sure that the body is kept in a healthy condition so that it can support and aid the heart. As discussed, cardiovascular disease is very common among women, so the singer should aspire to keep the body as healthy as possible. The singer can do this by maintaining a healthy diet, obtaining enough exercise, not smoking, and living a life that is as relaxed as possible. As performing results in considerable strain and anxiety in the singer’s life, the use of relaxation exercises is beneficial.

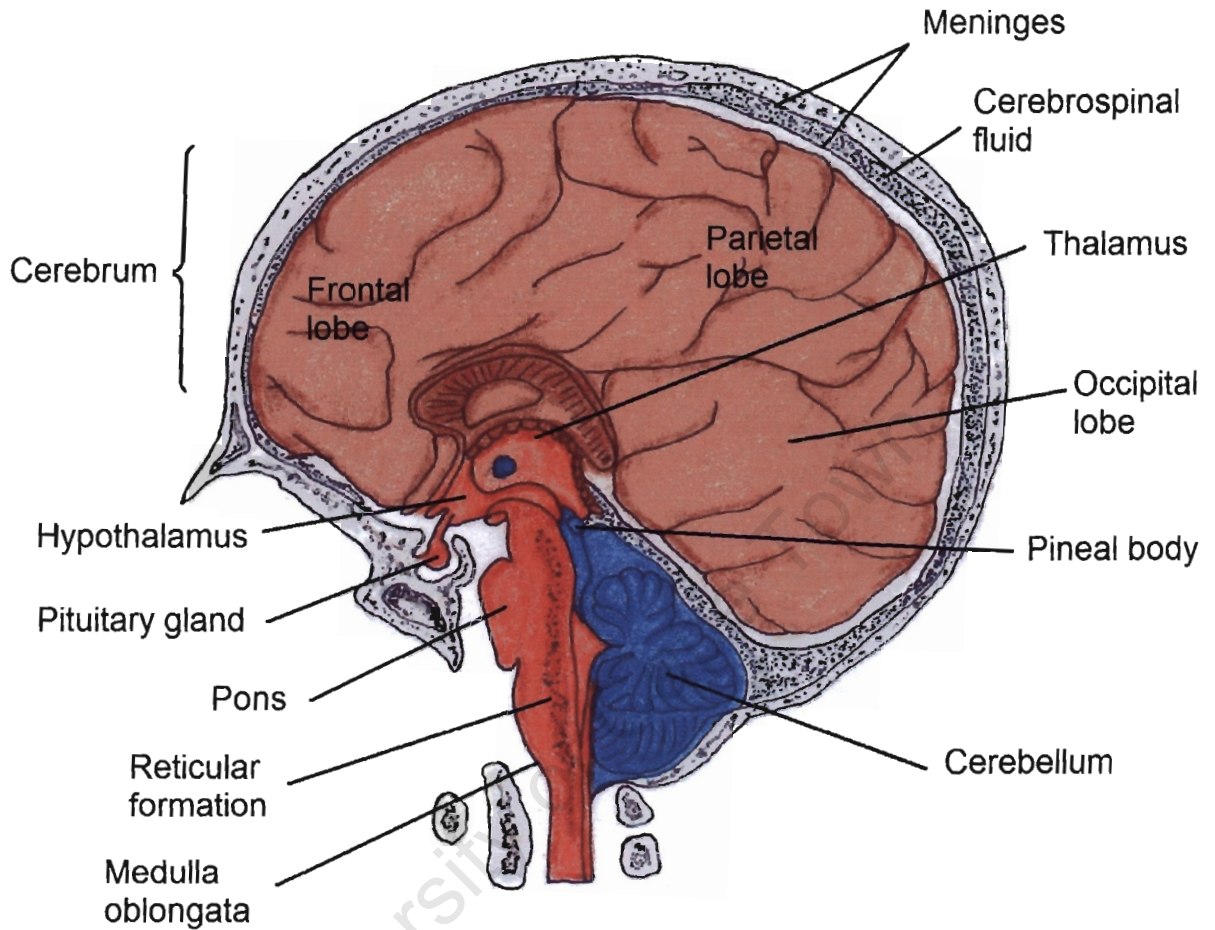
## **The central nervous system**

Information condensed from Kimball, *The Human Central Nervous System*, (2006) [Online]

### **Overview**

The central nervous system is comprised of the brain and the spinal cord. The brain receives sensory input from the spinal cord, as well as from its own nerves known as cranial nerves. The most important nerves from a singer's point of view are the cranial nerves. These are responsible for enabling hearing, controlling movement of the facial and throat muscles, innervation of the diaphragm, and indeed, allowing control all of the muscles and sensations required for singing, expression and vocalization. Most of the volume of the brain is used to process various sensory inputs, initiate appropriate action, and coordinate motor outputs. The spinal cord conducts sensory information from the peripheral nervous system to the brain and conducts motor information from the brain to various effectors, such as the skeletal muscles, cardiac muscle, smooth muscle and the glands. The spinal cord also acts as a minor reflex centre. The brain and the spinal cord both consist of grey and white matter. Grey matter is made up of masses of cell bodies known as neurons from which cell extensions start, known as dendrites, which criss-cross and join up with other dendrites at points known as synapses, across which nerve messages are transferred. The white matter is comprised of bundles of axons, each coated with a sheath of myelin. In the spinal cord the white matter is on the surface and the grey matter is on the inside and in the brain, the pattern is reversed. Both the brain and the spinal cord are covered in three sheets of connective tissue called the meninges. These sheets are the dura mater, the arachnoid, and the pia mater. The area between the arachnoid and the pia mater is filled with cerebrospinal fluid (CSF). This fluid flows uninterrupted throughout

the central nervous system and it returns to the blood through veins that drain the brain.



**Figure 11: The brain**

**Drawing is based on Kimball, *The Human Central Nervous System* [Online]**

### **The brain**

The brain consists of three parts, the hindbrain, the midbrain and the forebrain. The brain receives its nerve impulses from the spinal cord and 12 pairs of cranial nerves.

### **The hindbrain**

The main structures of the hindbrain are the medulla oblongata, the pons and the cerebellum.

- The *medulla oblongata* stimulates intercostal muscles and the diaphragm, enables breathing, regulates the heart beat and adjusts blood flow by regulating the diameter of the arterioles.
- The *pons* carries signals from various parts of the cerebral cortex to the cerebellum and helps with the reflexes that regulate breathing.
- The *cerebellum* is made up of two hemispheres and contains as many neurons as the rest of the brain combined. Its function is to coordinate body movements. It is the centre for learning motor skills (implicit memory).

### **The midbrain**

The midbrain is a small but extremely important part of the brain and contains essential areas that affect body functions. It has three features:

- The *reticular formation*, which collects input from the higher brain centres and passes it on to motor neurons.
- The *substantia nigra*, which function it is to smooth out the movements of the body.
- The *ventral tegmental area (VTA)*, which is high in dopamine-releasing neurons that are activated by nicotinic acetylcholine receptors and whose projections synapse deep within the forebrain.

## **The forebrain**

The forebrain is made up of a pair of cerebral hemispheres called the telencephalon and a group of unpaired structures situated deep in the cerebrum known as the diencephalons. The diencephalons have two structures that are affected by menopause:

- **The thalamus**

This is where sensory input passes through on the way to the somatic sensory regions of the cerebral cortex and then returns to it from there. The signals from the cerebellum also pass through the thalamus on their way to the motor areas of the cerebral cortex.

- **The hypothalamus**

Information condensed from Wikipedia, *Hypothalamus* (2006) [Online].

This is the seat of the autonomic nervous system and the source of eight hormones, two of which pass into the posterior lobe of the pituitary gland. These hormones have the following functions:

- *Thyrotropin-releasing hormone (TRH)* stimulates the release of the thyroid stimulating hormone and prolactin.
- *Gonatotropin- releasing hormone (GnRH)* - triggers the sexual development of the body.
- *Growth hormone-releasing hormone (GHRH)* stimulates the cells in the anterior pituitary to release the growth hormone.
- *Corticotropin-releasing hormone (CRH)* stimulates the anterior pituitary to release adrenocorticotrophic hormone.

- *Somatostatin* acts on the anterior pituitary to inhibit the release of the growth hormone and the thyroid stimulating hormone.
- *Dopamine* (a derivative of tyrosine) inhibits the release of prolactin from the anterior pituitary.

The six hormones discussed above are released into the bloodstream in periodic spurts and travel to the portal veins, to the anterior lobe of the pituitary where they then exert their effects. The following two hormones travel in the neurons to the posterior lobe of the pituitary, where they are released:

- *Antidiuretic hormone (ADH)* acts on the collecting ducts of the kidney to facilitate the reabsorption of water into the blood.
- *Oxytocin hormone* stimulates the smooth muscle in the body, for example it stimulates the uterus in the birth process and stimulates the release of milk in the breast when the baby starts to suckle.

### **The spinal cord**

Information condensed from Wikipedia, *Spinal Cord* (2006) [Online].

The spinal cord is cylindrical in shape and contains 31 pairs of spinal nerves (8 cranial, 12 thoracic, 5 lumbar, 5 sacral, 1 coccygeal) that arise along the spinal cord; these are mixed nerves, for they contain sensory and motor axons. The sensory axons pass into the dorsal root ganglion where their cell bodies are located and then into the spinal cord itself. The motor axons pass into the ventral

roots and then unite with the sensory axons to form the mixed nerves. The spinal cord proper ends at the point known as the conus medullaris. After the end of the spinal cord proper the spinal nerves continue as dangling nerves called the cauda equine, which, translated, means “tail of a horse”.

The spinal cord has two major functions:

- It is the connector of the peripheral nervous system to the brain. When information (nerve impulses) reaches the spinal cord through sensory neurons, the spinal cord transmits them into the brain.
- The spinal cord also acts as a minor coordinating centre which is responsible for some simple reflexes, such as the withdrawal reflex.

### **Why the central nervous system is important to the singer**

There seems to be a general belief among non-singers that singers have resonating cavities where other humans have brains. This is a misconception. When one considers the fact that a singer needs to memorize the entire score for a performance, along with all movements, while focusing on communication emotion to the audience, it is obvious that the brain and the central nervous system is as important to the singer as it is to other people.

The brain is the centre which controls all the various systems of the body. It is also the centre of a healthy mind and without the central nervous system the singer is incapable of functioning. It is therefore very important for the singer to stay as healthy as possible, both physical and mentally in order to perform at the highest possible level. It may be of interest to singers to know that in left-handed persons the speech centre is in the left and the music centre is in the right brain and vice

versa in right-handed persons. A left-sided stroke may leave a left-handed person without speech (aphasic) although she may still be able to hum a melody using the unaffected “music centre” in the right side of the brain.

University of Cape Town

## **CHAPTER III**

### **MENOPAUSE**

#### **Overview**

Information condensed from Northrup, *The wisdom of menopause* (2001).

During menopause, hormonal changes usually result in profound changes to the body, especially to the vocal folds. An in depth look at menopause will clarify the effect of hormonal changes on the physical, as well as on the psychological health of the female performer. Menopause takes various forms:

#### **Peri-menopause**

Peri-menopause (peri- means “near” or “around”) or pre-menopause is the transitional stage that ranges from 2 to 10 years before the complete cessation of the women’s menstrual period. As discussed previously, oestrogens and progesterone are produced by the ovaries and remain fairly stable during peri-menopause.

#### **Natural menopause**

Menopause occurs naturally in women in their late forties and early fifties, who have at least one ovary. This period may stretch from 5 to as much as 13 years. Around 2 to 8 years before menopause, women start skipping ovulation and their

periods may stop for a few months and return again from time to time. This is due to the gradual depletion of ovarian follicles, which act as the source for the ovum that ripens each month. As mentioned before, until menopause, the most important oestrogen in a woman's body is estradiol.

During peri-menopause the body starts to produce a different kind of oestrogen in the ovaries and body fat. This oestrogen is called oestrone. Progesterone levels start to fall during peri-menopause, usually before the changes in oestrogen and testosterone occur. Although reproduction is usually not important at this stage of a woman's life, these hormones are responsible for maintaining a healthy life, both physically and psychologically.

### **Premature menopause**

When the hormones that are responsible for reproduction are severely affected by illness or chronic stress, it can cause women in their thirties or early forties, who have at least one ovary, to start a premature menopause.

### **Abrupt menopause**

This type of menopause can be very traumatic. It can be caused by any of the following:

- Hysterectomy (surgical removal of the uterus and simultaneous removal of both ovaries)
- Chemotherapy or radiation due to an illness
- Medication that is used to treat certain conditions, for instance, uterine fibroids.

## **CHAPTER IV**

### **MENOPAUSAL SYMPTOMS AND THEIR TREATMENT**

Menopause can have a variety of effects on the systems of the body that are relevant to the singer. These menopausal symptoms, their treatment, and the effects of the symptoms and the treatment on the singer, will be examined in the same order in which the systems of the body were listed in Chapter II.

#### **The skeletal system**

##### **General effects**

The entire skeletal system is affected by the menopausal changes of hormones in the body. Normal bone consists of protein, collagen and calcium; during menopause it starts to lose these elements and becomes more fragile (Van Heerden, I. *Preventing osteoporosis*. [Online]). The major disease that affects the skeletal system during menopause is osteoporosis.

##### **Osteoporosis**

Information condensed from Health24, *Osteoporosis* [Online] and Crandall, *Osteoporosis* (2005) [Online].

When oestrogen levels drop, certain natural body cells begin to work overtime, destroying bone, while others begin to slack off on rebuilding bone. This causes an imbalance that leads to progressive bone loss. The effect of osteoporosis is to cause the skeletal bone to decrease in density and become very fragile, which

often results in bone fractures. The risk of a fracture depends on the bone mass achieved at maturity and the rate of subsequent bone loss after menopause.

The factors that may increase osteoporosis are:

- Being of the female gender
- Being Caucasian or Asian
- Having a thin and small body frame
- A family history of osteoporosis
- Cigarette smoking
- A lack of exercise
- A diet low in calcium
- Poor nutrition
- A vitamin D deficiency
- Mal-absorption (nutrients are not properly absorbed from the gastrointestinal system)
- Low oestrogen levels
- Amenorrhea (loss of menstrual period, sometimes caused by strenuous exercise or anorexia)
- Chemotherapy
- Hyperthyroidism (sometimes experienced by menopausal women).

### **Specific areas of the skeletal system affected by osteoporosis**

Information condensed from Riggs, *Rate of bone loss* (1986).

#### **The axial skeleton**

The specific effects that menopause may have on the axial skeleton are not certain. As discussed, peri-menopausal and post-menopausal women suffer from bone loss from the axial skeleton due to an oestrogen deficiency. Some women may also experience axial skeleton bone loss in their pre-menopausal years and this leads to the conclusion that there must be other factors in addition to oestrogen deficiency that contribute to bone loss.

### **The vertebral column**

Information condensed from Merck, In. *Compression Fractures of the Spine* [Online].

There seems to be a significant decline in vertebral bone mineral from the pre- to postmenopausal woman. The strength of vertebral bone is determined by the thickness, the size, the density and the micro-architecture of the bone. As a result of menopause, changes in the vertebral bone result in fractures, due to osteoporosis. Vertebral fractures are the hallmark of osteoporosis and have serious consequences, such as:

- Severe back pain
- Disability
- Reduced quality of life
- Decrease in lung capacity
- Loss of appetite
- Sleeping disorders
- The risk of future fractures

Should vertebral osteoporosis become very serious, it could result in a kyphotic spine or scoliosis. Kyphotic spine is when the normal kyphosis

(curve) of the spine becomes abnormally pronounced. Scoliosis is a condition where the spine, which is normally straight when viewed from the front or the back, develops a lateral side to side curve. Either of these conditions can cause height loss, the inability to stand upright, pulmonary volume loss, constipation, protruding abdomen, and a gap between the ribs and the iliac crest. The psychological consequences of this disease include depression, diminished self-esteem, anxiety, a dependency on others and an inferior quality of life. The shortened stature and height of women have lead to the colloquial description of “little old ladies”, which would not strike a very convincing picture on stage, except, perhaps in comedy roles.

### **The thorax**

Some women suffer from thoracic osteoporosis and this results in a lower vital capacity, a lower aspiratory capacity, and a lowering in lung capacity.

### **The upper and lower extremities, shoulder girdle and pelvis**

#### **Upper and lower extremity fractures**

Fractures may occur in any age group, but are frequently seen in those who are suffering from osteoporosis. The most common fractures that occur as a result of osteoporosis are spinal, hip and wrist fractures but, as a result of the entire skeletal system being weakened by osteoporosis, a fracture can occur anywhere.

#### **Shoulder girdle fractures**

Information condensed from Merck, *Shoulder Fractures* [Online].

Shoulder girdle fractures in people with osteoporosis are usually the result of a fall. Symptoms include severe shoulder pain, redness of the shoulder, bruising of the shoulder and deformity. Treatments given are:

- A chest strap
- A shoulder ring
- A shoulder immobilizer
- Strengthening exercises
- Surgery, if the bones are out of position and have to be reset

### **Wrist fractures**

Wrist fractures commonly occur in people with osteoporosis due to a fall and the hand being instinctively being put forward to break the fall. Symptoms of a wrist fracture include swelling, tenderness, pain, deformity and difficulty in bearing weight on the wrist. Treatment is usually by means of a cast that immobilizes the thumb and wrist for approximately six weeks. After this period an x-ray is taken to determine the degree of healing and, if necessary, the wrist is set in a cast again. Surgery may be required if it is found that the break is not healing well (Merck, *Wrist Fractures* [Online]).

### **Hip fractures**

Most hip fractures occur near or at the upper end (head) of the thighbone (femur) and are as a result of a fall in people suffering from osteoporosis. It is also well known and possible that a person

with severe osteoporosis may experience a spontaneous fracture, which leads to the fall and not the other way around. Symptoms of the hip fracture include pain, a weakness in the leg, the leg appears shorter when the person is lying down and the foot is turned out to the side. Treatment usually involves surgery. The type of surgery depends on the severity of the fracture and the activity level of the person (Merck. *Hip Fractures* [Online]).

### **Pelvic fractures**

The pelvic fracture is defined as a disruption of the bony structure of the pelvis. This type of fracture is uncommon but may occur in a major accident or those suffering from osteoporosis. Symptoms of the pelvic fracture include pain in the groin, pain in the hip or lower back, abdominal pain, numbness in the groin or legs, bleeding from the vagina, rectum or urethra, difficulty in urinating and difficulty in standing or walking. The treatment of a pelvic fracture depends on the severity of the fracture. A minor fracture will require bed rest and pain medication. Physiotherapy and healing could take a few weeks to several months. A severe fracture usually is accompanied by shock and internal bleeding. Surgery is needed in these cases and the person generally requires a lengthy rehabilitation period (Gale. *Pelvic Fractures* [Online]).

## Treatment for osteoporosis

### General treatment

Information condensed from Van Heerden, *Preventing osteoporosis* [Online].

It is possible to prevent osteoporosis by starting at a young age. Taking enough calcium and exercising regularly is a very good start. Maintaining a healthy diet of fruit, low fat dairy products, fish, chicken, soy, oatmeal, wheat products, fruit juices, tofu, honey and water is highly recommended. It is advisable to avoid food such as chocolate, soft drinks, sugar, food high in animal fat content, salt and alcohol.

During peri-menopausal and menopausal years it is highly recommended that the following treatment be followed, especially when combined with daily physical exercise to strengthen the skeleton such as walking, running, skipping and tennis:

- Extra calcium intake of 1500mg/day for postmenopausal women who are not taking oestrogen
- Extra calcium intake of 1000 mg/day for pre- and postmenopausal women who are taking oestrogen
- Extra intake of vitamin D, which helps to absorb calcium

Menopausal hormone replacement therapy, also known as HRT, has been shown to prevent bone loss, increase bone density and prevent bone fractures. It is very useful in preventing osteoporosis in postmenopausal women. Oestrogen supplements such as Premarin, Estrace and Estraderm

are available; each individual should discuss these options with her physician, as each will have a different balance of risks and benefits to be expected from hormone replacement therapy.

### **Hormone replacement therapy (HRT)**

Information condensed from United States Department of Health and Human Services, *Hormone replacement therapy (HRT)* (2004) [Online].

Hormone replacement therapy is the active replacement of a woman's depleting hormone levels with oestrogen and progesterone (progestin).

#### **Oestrogens**

There are two oestrogens available for treatment. The first is a synthetic oestrogen, similar to those found in contraceptives. It has a greater potency but this treatment is not popular, due to various negative factors involving the liver.

The second oestrogen is a naturally occurring one. Only a small dosage of this oestrogen is needed to maintain axial and peripheral bone mass.

The treatment is available in oral and non-oral form such as patches, creams and implants. The oral treatment has a rapid conversion of estradiol to estrone in the mucosa of the gut. It is absorbed into the portal Venous system and into the liver. This treatment may have an affect on the cholesterol level of the body and, depending on the dose of oestrogen, the treatment may lead to

an increase or decrease in cholesterol levels. The non-oral treatment goes directly into the systemic circulation and avoids the liver, thus reducing the risk of high cholesterol. The choice of treatment depends entirely on the individual.

### **Progestin**

Similar to oestrogens, there are two types of progestin available for treatment - synthetic and natural. The synthetic progestin is structurally related to progesterone and testosterone, while the natural progesterone, derived from plant sources, is nearly identical to the body's own.

There are two ways of administering hormone replacement therapy:

- Cyclic therapy

Oestrogen is taken from day 1 to 25 and progesterone is added for the last 12 days.

- Combined/continuous therapy

Oestrogen is taken for every day of the month and the progestational agent is added for the first 12 to 14 days.

Lower doses of oestrogen and progestin are needed in this form of therapy, which reduces the possibility of weight gain, fluid retention, breast tenderness and withdrawal bleeding.

It seems to be the practice to start pre-menopausal women on cyclic therapy for 1 to 3 years and to move to combined/continuous therapy thereafter.

### **Effects of HRT on the singer**

Some of the potential side effects of the HRT treatments on the singer are an increase in cholesterol levels, weight gain due to the high oestrogen levels, fluid retention, breast tenderness, and withdrawal bleeding. All of these factors could make the singer's performing more difficult. Weight gain may make movements difficult and cause breathing to be more difficult and fluid retention inhibits the singer's support of the voice. Breast tenderness and withdrawal bleeding could leave the singer with pain and discomfort. However, if HRT is administered correctly there should be no reason for the singer not to be able to perform as she normally does (Rutherford, *The menopause* (2005) [Online]).

There is a concern in medical circles that a too high dosage of progestin may have an affect on the voice. Because progestin is a male hormone, the possibility exists that the treatment may lower the voice. It is therefore advisable for the singer to discuss this possibility with her doctor before taking progestin (Abitbol, *The voice and menopause* (1998) [Online]).

Research in the USA and South Africa by researcher Dr. Jacques Rossouw, which was recently published in the USA and reported in the South African media, cast serious doubt on some of the alleged benefits of HRT: see Die Burger, 4 Mei, 2006: (“Hormone dokter laat wereld regop sit”).

### **Summary of effects on the singer**

The consequences of osteoporosis are:

- A decrease in the quality of life due to considerable pain
- A proneness to vertebral fractures, pelvic fractures and wrist fractures
- Major change in stature and physical appearance of the singer due to kyphosis and possibly scoliosis, in cases where vertebral collapse is not symmetrical.

Osteoporosis has a serious effect on the singer as she depends on the spine, the hips, and upper extremities for good posture, movement, and support of the voice. Not only can the singer be affected by the disease, but the HRT treatment for osteoporosis may also have a negative effect.

Axial skeleton bone loss may inhibit a singer's ability to perform, as she is dependent on the usage of the axial skeleton for movement, breathing and voice production.

A singer suffering from osteoporosis of the spine may have great difficulty in continuing her performing career, depending on the severity of the disease. Should

the effect of the disease be mild, she may still be able to maintain a good posture, move efficiently and have enough strength in the spinal chord to support her body and therefore her vocal production. However if the disease is advanced, it may become impossible for a singer to continue her career. The entire body depends on a healthy vertebral column and the singer will not be able to maintain the performing standard that her audience expects from her if that is not present.

Problems of the skeletal system brought on by menopause can range from relatively mild joint pain discomfort to severe problems such as pelvic and hip fractures. Should a singer suffer from any of the abovementioned fractures it will depend very much on the severity of the fracture as to whether she would be able to continue to perform or not. If the fracture is not severe, there should be no reason for her not to continue performing, however, she might have to reassess her ability to perform after she has healed if the fracture is severe. It is extremely important that a singer start to prepare her skeletal system for menopause from an early age using the treatments mentioned above.

Serious cases of osteoporosis can have such a debilitating effect on the singer that it is very likely that she will have to stop singing altogether. It is worthwhile noting, however, that two highly successful South African sopranos, Margaret Van Der Post and Gerda Hartmann, had great success as performers despite severe physical handicap due to the effects of childhood polio. Margret Van Der Post later became a singing teacher at the University of the Free State and Gerda Hartmann gained international success at Lieders, oratorio and modern vocal interpreter. She is currently professor of singing at the Conservatoire de Paris.

## **The muscular system**

### **General effects**

Studies have shown that menopause is associated with changes in the body that promote a loss of fat-free mass and a decline in skeletal muscle. This, in turn, may be related to the loss of muscular strength and a decline in physical activity that may affect the entire body (Dionne, *Sarcopenia* (2000) [Online]). The body's muscles respond to the hormonal changes that occur during menopause by feeling sore and cranky, joints start to ache, and the tension in muscles tends to increase.

There are several conditions that may affect the health of the muscles in the body in general, such as osteoporosis (described under the skeletal system), carpal tunnel syndrome, fibromyalgia, osteoarthritis (which will be discussed under the muscular system) and thyroid disease (which will be discussed under the endocrine system). These diseases can all lead to the aching and stiffening of joints, atrophy of the muscles, muscle weakness, cramps, and muscle inactivity.

### **Aches and joint stiffness**

Information condensed from Giblin, *Osteoarthritis* (2005) [Online].

Aches and joint stiffness in peri-menopausal, menopausal and postmenopausal women may be the result of osteoarthritis. This is a condition where the cartilages that cover the end of the bones begin to wear down and bone begins to rub against bone. If this is not treated it may result in disability. Osteoarthritis can affect any joints but the hips, knees and the spine are the ones most commonly affected.

Some of the symptoms of osteoarthritis are stiff and painful joints, stiffness after resting the joint, pain in the joint, which worsens after exercise, and the swelling of the joint. Osteoarthritis usually appears in women during their peri-menopausal, menopausal and postmenopausal years due to the fluctuating hormone levels but obesity, heredity, age (40 plus), a diet high in sugars and carbohydrates, too much stress, and caffeine are also contributing causes..

Treatment is usually in the form of dietary supplements such as glucosamine, a healthy diet, hormone replacement therapy to balance the fluctuating hormone levels, and in more severe cases, joint replacement might be required.

Aches and joint stiffness due to osteoarthritis may pose a problem to the singer as she relies on her joints for general movement on the stage and for dancing. Joint stiffness may not only inhibit her movement but also cause her extreme pain and prevent her from being able to concentrate. It will depend on the severity of the condition as to whether the singer will be able to continue performing or not. If the resulting pain and immobility is not severe she may be able to perform without any difficulty by taking a dietary supplement and pain medication, if necessary. In cases of surgery she may have to take time off for the healing of the joint and then make an assessment as to whether her mobility is impaired to such a degree as to require her to discontinue her work. The severe deformity of the fingers and hands, which frequently develops, may become unsightly and aesthetically displeasing to the audience and a source of discomfort and self-consciousness for the singer.

## **Fibromyalgia**

Information condensed from Fibromyalgia Network, *FIBROMYALGIA* [Online].

Research has shown that women in their menopause also have more symptoms of the condition fibromyalgia than those who are premenopausal and that a drop in oestrogen levels may be the reason. Fibromyalgia, as the name implies, is a condition characterized by pain (algor) in connective tissue (fibro-) and in muscle (myo-), ligaments, and tendons. The symptoms of this disorder are:

- Deep muscular pain, along with a sensation of burning in the muscle
- Extreme fatigue, with the arms and legs feeling like concrete blocks
- Sleep disorder - constant waking due to too much brain activity
- Irritable bowel syndrome characterised by abdominal gas, diarrhoea, constipation and/or abdominal pain
- Chronic migraine and tension headaches
- Joint dysfunction syndrome, characterised by pain in the muscles of the face, head and the jaw.

The cause of fibromyalgia is believed to be the deficiency of the relaxin hormone caused by menopause. Relaxin is a hormone required for the relaxation of smooth muscle. There also seems to be a genetic susceptibility. It can affect various parts of the body, but those mostly affected are:

- Striated muscle
- Smooth muscle
- The cardiac muscle
- The autonomic nervous system
- Connective tissue

- The cardiovascular system

Treatment for fibromyalgia includes:

- Pain management with non-steroidal, anti-inflammatory medication, such as ibuprofen

- Sleep management

The person should start a healthy sleep regimen by going to bed at the same time every night and waking the same time the next day.

- Psychological support

This should be provided through friends and family and, if necessary, a support group.

- Small doses of anti-depressants as prescribed by a doctor, preferably in consultation with a psychiatrist

- A natural supplement such as Vitalaxin

This is believed to be an excellent treatment for fibromyalgia. It is taken orally and results can be experienced 8-9 weeks after the person has started treatment. It is a natural form of replacement for the critical hormone, relaxin.

The severe pain, discomfort, and fatigue that accompany the condition may become a serious problem for the singer, as she is highly dependent on her energy on stage. A constant feeling of tiredness and pain may cause her great difficulty in her performing and unless the treatment can relieve the symptoms, she may not be able to sing. The intake of strong painkillers as a treatment (see above) may slow her movements and inhibit her concentration, and in the case of an anti-

depressant, she may not be able to feel the intensity of emotional involvement to which she is accustomed, thus affecting her performance. Anti-depressants may have a numbing effect on the emotions and the singer may feel out of touch with her audience and be unable to convey the amount of emotion needed in performing. It is very important to realize that well-known side effects of some anti-depressants may include dryness of mouth and throat, as well as unpleasant stiffening of muscles with a Parkinson-like shuffling of gait and coarse tremor, all of which are highly undesirable as a singer.

## **The upper extremities**

### **Carpal tunnel syndrome**

Information condensed from National Institute of Neurological Disorders, *Carpal Tunnel* (2002) [Online].

Carpal tunnel syndrome, also known as repetitive strain injury, is a condition that occurs in menopausal women, who usually also suffer from hypothyroidism. It occurs when the median nerve is compressed where it runs through a tunnel formed by a tendon-like membrane at the wrist and can occur in one or both arms. The pinched nerve results in the brain being unable to send or receive messages to and from the muscles in the wrists and hands. This condition may also be aggravated by poor posture, stress and repetitive motion.

Symptoms include a burning, itching, and tingling numbness of the hand and fingers, often described as a feeling of “pins and needles” and the fingers sometimes feel swollen. The person may experience the feeling of having to shake their hands awake when they wake in the morning. Should

the condition become more serious, they might experience a decrease in the grip of the hand and in severe cases the muscles of the thumb may waste away.

Treatment usually includes treating the pain and swelling with pain-killers and/or non-steroidal, anti-inflammatory drugs, as well as undergoing physiotherapy, where the exercise is concentrated on stretching and strengthening the muscle. In more severe cases surgery may have to be performed, which is usually very successful and results in complete recovery from the condition.

A singer suffering from carpal tunnel syndrome may have difficulty using her hands while performing. This is especially so for singers that also play an instrument. The singer may experience problems concentrating due to pain and the effects of the medication. Fortunately, the singer should have no reason to fear that this may cause the end of her career as treatment of this condition seems to be effective. As healing and therapy for the condition is usually over an extended period, she may have to be patient with her treatment and modify her performing accordingly.

### **The abdominal muscles**

Abdominal muscle becomes loose during menopause, fat seems to build up and muscle seems to slowly decrease. Performing exercises that target the abdominal muscle, such as sit-ups, are an effective treatment. It is very important for the

singer to keep her abdominal muscles toned, as these muscles are essential for the supporting of her voice.

### **The pelvic muscles**

The sex hormones seem to maintain a firm tone of the pelvic muscles, but as oestrogen lowers, the pelvic muscles collapse and the uterus with anchoring ligaments tend to fall forwards and downwards, a condition referred to as prolapse, which may also affect the bladder. This may lead to the disconcerting and embarrassing condition of urinary incontinence so that urine leaks out, especially when the pressure inside the pelvis increases, as with coughing and during some stages of singing. Treatment for this condition include exercises that contract or tighten the pelvic muscles. Oestrogen treatment seems to improve the pelvic floor muscle tone. In serious cases surgery might have to be performed (Epigee, *Menopause* (2005) [Online]).

### **Summary of effects on the singer**

It is important for the singer to keep her muscles toned for as long as possible, as she uses these muscles to aid her in supporting her voice. The use of hormones to improve muscle tone, in conjunction with the use of regular exercise, should allow the singer to maintain her career. If surgery is required, she may have to institute a temporary halt to her career while she undergoes the surgery and recovers from it, but she will usually be able to return to performing if the surgery and subsequent healing is successful.

## **The endocrine system**

### **General effects**

The endocrine system changes during menopause. Various hormonal changes occur in the body and these result in many symptoms appearing that singers have to deal with. Apart from the hormonal changes in the ovaries that result in the various menopausal symptoms (Rutherford, *The menopause* (2005) [Online]), there are other hormonal changes that can result in thyroid disease and in changes that can affect the adrenal glands (Mathur, *Thyroid Disease* (2002) [Online]).

### **Thyroid disease and menopause**

According to Holmes, *Hypothyroidism* [Online], many women have problems with depression, weight gain, restlessness, palpitations, and chest pains during menopause. The recommended treatment for these conditions usually consists of hormone replacement therapy and the use of calcium supplements. In some cases, however, this treatment is ineffective, and the treated women do not feel any better. This could be an indication of hypothyroidism (under-active thyroid).

### **Hypothyroidism**

When somebody suffers from hypothyroidism, their thyroid gland is producing too little of the thyroid hormone. The result of this is that all the body systems slow down. Because the metabolism of the body also slows down, the body is not able to generate enough heat to keep the person warm (Corio, 2000: 325-327).

Should a singer suffer from hypothyroidism, the following symptoms may leave her unable to perform (Corio, 2000: 325):

- Low body temperature

A singer feels uncomfortable performing when she feels cold. This is likely to influence her vocal ability as it is not easy to control the voice when the body is cold and shivering.

- Anaemia

Anaemia is a condition where the body suffers from an iron or copper deficiency. Anaemia is also an indicator that someone may be suffering from hypothyroidism and the following symptoms may be exhibited:

- A feeling of weakness and low energy levels
- A rapid heart rate
- A pale appearance to the lower lining of the eyelids
- Faintness and breathlessness
- Inability to sleep (insomnia)
- The loss of hair
- A low level of mental energy
- Bruising that occurs to the body with no reason
- A reduced ability to exercise
- Dizziness upon standing
- Waking up and gasping for breath
- Long or unusually heavy menstruation
- An increase in the above symptoms when the person moves to a higher altitude

These symptoms would definitely affect the singer's ability to perform in the following ways:

- Weakness and low energy levels may result in her not being strong enough to produce the sound or to provide the support for the sound that is necessary for her performance.
- A rapid heart rate is likely to affect her breathing. Breathing is the singer's most important source of voice production and she cannot function without being able to control it.
- Faintness may cause her to lose her balance. As good posture and balance is essential to the singer's performance, this is a very serious problem. Voice production is affected if the singer is not balanced properly, as the necessary support is not present to carry the voice.
- Insomnia can exacerbate the singer's already low energy and concentration levels and lead to problems on stage. Low mental energy levels can cause the singer to forget the words of the aria or song being performed; she could forget her music, as well as the movements that were given to her during production rehearsals. A memory lapse by one of the cast can cause serious trouble, especially in ensemble numbers. The singers, the conductor and the technical crew all depend on those involved to be responsible for remembering their part in the successful running of the show. When a member makes a mistake the cast and crew

are called upon to improvise and deal with the situation in the appropriate manner so that the audience does not become aware of it but sometimes this is not possible and entrances are missed, ensemble between the singer and the orchestra suffers, or a forgotten prop or action may undermine the dramatic continuity.

- A reduced ability to exercise is a serious problem to the singer. The singer's body is similar to that of an athlete. The amount of movement that is involved on the stage, combined with the production of the voice, requires a healthy and energetic body.
- Singers frequently travel and may visit different parts of the world within the span of a single day. If the singer is suffering from hypothyroidism and suffers from dizziness or gets affected by high altitudes, this will certainly pose a problem. As altitude increases it becomes more difficult for a singer to reach notes of the higher range and breathing becomes more difficult. Hypothyroidism aggravates this problem.

Medication can be prescribed by a doctor to help alleviate the symptoms of anaemia. According to Shomon, *Hypothyroidism* (2006) [Online], eating food that is high in iron content such as green vegetables, meat (especially red meat), wheat germ, dried fruit, and oysters will help to raise the level of iron in the body. Eating food that is high in vitamin C will in turn help the body to

absorb iron better. It is advisable to limit the drinking of tea, with the exception of herbal tea, as the tannins in tea inhibit the absorption of iron. Drinking sodas and beer, and eating candy bars and ice-cream should be avoided, as they are known to block the absorption of iron.

- Constipation

Constipation is defined as the hardness of stool or difficulty or inability to pass faeces. This could result in discomfort and pain if the condition gets serious, which can lead to performance difficulties. A diet high in fibre can help to relieve the problems of constipation.

- Delayed reflexes

Delayed reflexes may cause problems for a singer as the delayed reflex may result in her reacting too late to a conductor's signal. Singers who also use an instrument may be affected even more severely.

- Dry skin and dry hair

The New Zealand Dermatologic Society, *Skin problems* (2005) [Online], states that the skin, nails, and hair of someone suffering from hypothyroidism may be affected in various ways. The symptoms include:

- The skin becomes cold and pale
- The skin has a yellowish hue to it, due to a condition called carotenaemia
- Hair becomes brittle and falls out in handfuls

- Nails grow slowly and become very brittle
- Someone suffering from hypothyroidism is also prone to develop dermatitis, called eczema craquele (paving and splitting of the skin's surface layer)
- There is an absence of sweating
- The person suffers from puffy hands, face and eyelids (oedema)

Margesson, *Thyroid disease* (2000) [Online] suggests the following treatments to help with dry skin problems in hypothyroidism:

- Avoid the use of harsh soaps and lotions
  - Wash only the areas of the skin that are really dirty with a cleaning bar
  - Apply moisturiser to the skin after washing while the skin is still damp, as this will help the skin to retain moisture.
- Depression
 

Hypothyroidism is often associated with depression and vice versa, and hypothyroidism should be considered when the depression does not respond to anti-depressants. There are psychiatrists that suspect that hypothyroidism contributes to depression and have found that patients treated with medication for hypothyroidism as well as with anti-depressants respond positively and their depression symptoms disappear (Mathur, *Thyroid Disease* (2005) [Online]).
  - High cholesterol

As the thyroid is producing low quantities of the thyroid hormone, the body's metabolism rate drops and cholesterol levels go up. High cholesterol levels may also lead to heart disease. Using medication prescribed by a doctor for hypothyroidism should also correct the problem of high cholesterol associated with hypothyroidism (Green, *Cholesterol* (2006) [Online]).

- Fatigue

The most common complaint of hypothyroidism is that of extreme fatigue, which no amount of sleep seems to cure. If hypothyroidism has been diagnosed, thyroid replacement therapy should help to cure the symptom of fatigue. If the fatigue is not eliminated, some other illness may be the cause of the fatigue. Fatigue is a serious condition for the singer as she cannot perform well when she feels exhausted.

- Hearing loss

Deafness may be one of the symptoms of hypothyroidism. Fortunately, these symptoms usually disappear with thyroid hormone replacement treatment. Hearing loss is an extremely serious condition to the singer. Any problem with the singer's hearing may result in incorrect singing and severe problems with the singer's intonation. Total hearing loss will inevitably result in the singer not being able to sing at all.

- Irregular periods

Hypothyroidism affects the regularity of a woman's periods due to the decrease in oestrogen levels. This is likely to be an

inconvenience to the singer as periods cause pain, a loss of energy, and difficulty using the abdominal muscles to support the voice. Having irregular periods prevents the singer from scheduling performances around her period times, forcing her to consider taking medication to overcome the symptoms of her period.

- Hypertension

Hypothyroidism may cause the heart rate of the person to slow down and reduce the heart's pumping capacity. This, in turn, may increase the stiffness of the blood vessel walls and the result is likely to be high blood pressure (hypertension). Although treatment of hypertension with thyroid replacement therapy is usually successful, limited success is usually experienced if an anti-hypertensive medication is used without thyroid replacement therapy. Hypertension may cause the singer to feel light-headed and dizzy. Mild cases of hypertension are usually not a serious issue to a singer but severe cases are likely to be a problem if most of her performing is done in a standing position.

- Slowness in speech and mental function

These symptoms are obviously a great handicap to a singer, who usually relies on her memory to remember the words, music and movements for the entire performance.

- Water retention

Water retention causes lethargy in the abdominal muscles. The singer then struggles to support the voice as the muscles are not working efficiently. Water retention may also have an effect on the

larynx, resulting in swelling of the vocal folds, with change of pitch and voice tone.

- Deepening of the voice

On rare occasions, deepening of the voice can occur in female performers due to hypothyroidism. Fortunately thyroid replacement therapy usually corrects the problem (Davies, *Care of the professional voice* (2000) [Online]).

### **Hyperthyroidism**

Hyperthyroidism is a disease that may also be caused by hormonal changes during menopause. In contrast to hypothyroidism, hyperthyroidism speeds up the metabolism, burns up the body's energy stores and creates many symptoms throughout the body. It is less common than hypothyroidism and it is also known as Grave's disease. This disease is a condition where the body starts to make antibodies to the thyroid gland in the form of thyroid-stimulating immunoglobulin, which stimulates thyroid hormone production. Treatment is usually given in the form of an anti-thyroid medication. In more stubborn cases radioactive iodine therapy is given to destroy the thyroid, or the gland may be surgically removed (Corio, 2000: 328-330). Generalized or nodular swelling of the thyroid gland may be seen both in conditions of hypo- and hyperthyroidism and may become visible as unsightly swelling in the front of the neck, overlaying the larynx area. This is known in lay terms as "goitre", which may be nodular or diffused and may be quite unsightly on stage.

## **Thyroid cancer**

According to Corio, *The change* (2000: 333), thyroid cancer is an oestrogen responsive tumour. Situations that raise a woman's exposure to unopposed oestrogen can increase her risk to thyroid cancer, including:

- Being of the female sex
- Early menarche (the onset of menstrual periods at a very early age) and late menopause
- Infertility
- Surgical menopause
- Not smoking - smoking decreases the risk of thyroid cancer because it reduces the circulating oestrogen as well as body weight

Depending on the severity of the case, thyroid disease, be it hypothyroidism, hyperthyroidism or thyroid cancer, may be a serious condition for the singer. In cases of hypothyroidism and hyperthyroidism, treatment is usually successful and singers should not suffer any long term effects. A singer I interviewed (B, 2005), had her thyroid gland completely removed. She recovered fully and sings without any problems. A very real and catastrophic mishap can occur during surgery on the thyroid gland if the recurrent laryngeal nerve, which supplies the vocal folds, is cut through or damaged. Should this occur, permanent paralysis of one or both vocal chords may result, which will destroy the career of a professional singer. Thyroid cancer is a much more serious disease and this condition may result in the early termination of a singer's career. In some rare cases

thyroid cancer may spread into the larynx, completely destroying the singer's instrument.

### **The adrenal glands**

Information condensed from (Holmes, *Adrenal fatigue* [Online]).

The adrenal glands secrete hormones that act to put the body on alert. Should the level of these hormones rise too high it may have a destructive effect on the body, an example of this being that of too high cortisol levels. Normal levels of cortisol help the body to convert protein into energy. Too much cortisol destroys healthy muscle and bone, slows down normal cell generation and healing, slows down the metabolism and mental function, and weakens the immune system. Adrenal fatigue may be a factor in many of the conditions that have previously been described, such as fibromyalgia, hypothyroidism, chronic fatigue syndrome and premature menopause. When the adrenal glands are overworked and straining to maintain high cortisol levels, they are unable to produce sufficient amounts of DHEA (dehydroepiandrosterone), which is a precursor hormone to oestrogen, progesterone and testosterone and is necessary to balance the hormones in the body. Insufficient DHEA contributes to fatigue, bone loss, loss of muscle mass, depression, aching joints, decreased sex drive and an impaired immune function.

The treatment to restore a healthy adrenal function could be a dietary change that will enrich the nutrition levels and reduce the carbohydrates and stimulants. The taking of nutritional supplements, which include fatty acids from fish oil, the reduction of stress, moderate exercise and plenty of rest are essential to give the body time to heal.

In the case of severe adrenal fatigue, low doses of DHEA may be prescribed but, as this treatment has serious side effects, it should be under the direct supervision of a doctor. In extreme cases, improvement can usually be seen within four months of treatment, with recovery in mild cases being considerably shorter.

### **Summary of effects on the singer**

Problems with the endocrine system that are caused by menopause are likely to require that a singer take time off to heal her body. As seen above, these symptoms can have severe effects on the singer. Her body needs all the energy and strength possible during a performance and delivering a good performance becomes impossible when it is so fatigued. In the case of adrenal fatigue, the singer is very prone to the condition, as there is a surge of adrenalin every time she performs. This can leave her exhausted and without the desire to sing. After the treatment suggested she may be completely healed and ready to go back to the stage. The symptoms of hypothyroidism or hyperthyroidism are varied and most of them would definitely affect a singer's ability to perform. Fortunately treatments exist to address these problems and the singer should be able to resume her singing career in many cases. As noted, thyroid cancer is a much more serious disease and this condition may result in the early termination of a singer's career.

Treatment of adrenal fatigue with DHEA, however, should be discussed in detail with a singer's doctor, as this is a therapy that includes male hormones, which might lower the female voice and this is irreversible. For the female singer, especially in the higher voice groups, this can be a very serious problem.

## **The urinary system**

Information condensed from Lum, *Changes with age* (2006) [Online].

### **General effects**

The vagina, the urethra and the supporting tissue of the bladder and the sphincters are affected by atrophy in the same way as atrophy affects muscles in general in the body. The urethra loses its thick lining and becomes like a hollow tube and the pelvic muscles get weaker during menopause. Because of this it is less able to stop urine flow and can also contribute to an increase in bladder infection.

### **Urogenital changes**

There are a variety of urogenital changes that are brought on by menopause:

- **Frequency**

Frequency is feeling the need to urinate more, although the bladder may not be full. If a singer suffers from this symptom it may cause her problems while she is performing, as it is often not possible to leave the performing area in order to go to the toilet. As a result of this she may become uncomfortable, distracted, and lose control of her vocal support. This can also result in her becoming anxious and delivering a poor performance.

- **Urinary incontinence**

Urinary incontinence is a condition that causes urine to leak from the bladder when crouching, laughing or lifting. In the case of the singer,

urinary incontinence may cause problems as she uses the lower abdominal muscles to support the voice.

- **Nocturia**

Nocturia is the need to urinate several times during the night. This may result in a lack of sleep, which can cause tiredness, poor concentration and a lack of energy. This can cause the singer problems as she depends on her physical vitality and mental alertness to do her work properly.

- **Painful urination**

The singer may have a problem with the bladder and the pelvis in general if she suffers from painful urination. Pain in this area will result in her having difficulty in supporting her voice.

### **Summary of effects on the singer**

Oestrogen replacement seems to be an effective treatment for urogenital problems. This is good news for the singer, as she will be able to continue performing after successful treatment. Oestrogen treatment does not seem to have any negative effect on the voice.

## **The respiratory system**

### **General effects**

The functions of the respiratory system are central to the art of singing, and the symptoms of menopause in this area can have a considerable impact on the singer.

### **The nose and mouth**

The nose and mouth have mucous membranes that tend to become drier as a result of the oestrogen levels that are dropping in the body. An increase in fluid intake may help to relieve this symptom. In some cases menopause can lead to tooth loss and to the use of dentures, which are likely to result in articulation difficulties and affect the singer's use of her palate (Davies, 2004: 18). Marita Knobel, a South African opera singer in Germany for many years and co-author of the book "Singing Opera in Germany" recommends eight glasses of water per day for any singer.

### **The larynx**

Information condensed from Davies, *Care of the professional voice* (2004: 17-19). As the voice ages, several characteristics develop that are referred to in the medical field as senile phonaesthesia. The voice loses power and resonance as it gets older and the mean fundamental frequency drops in females from 225Hz (roughly A below middle C – 220Hz) in the 20 year old group to 195Hz (roughly G below middle C – 196Hz) in the 80 year old group. There are various characteristics to this vocal syndrome and they are sometimes referred to as the characteristics of the menopausal vocal syndrome. They are:

- Vocal fatigue

During menopause the vocal tissue becomes dryer. This results in greater effort to make the vocal folds vibrate. The singer ends up working much harder and this contributes to vocal fatigue.

- Decrease in range

During menopause the singer may experience a loss of high notes and a loss of vocal quality.

- Laryngeal mucosal changes

Mucosal changes in the larynx may lead to the vocal folds bowing and the voice weakening (Scherer, *BASIC OVERVIEW* [Online]). The cartilages of the larynx may harden due to ossification or calcification depending on the type of cartilage. The mucous glands may change which may result in an insufficient application of mucous protection to the vocal folds (Davies, 2004: 103).

Regular exercise of both the body and the voice should result in a relatively healthy and clear voice and the ageing process can be largely avoided or even reversed. Exercise such as swimming, walking and aerobics is preferred; although these activities do not directly exercise the muscles of the larynx they can tone the muscles of the neck, back thorax and the abdomen. Later in the singer's life the lungs will also lose elasticity, the thorax will become more rigid and the abdominal muscle will deteriorate. As this is the power source for the singer, ensuring that regular exercise is undertaken is extremely important. If the singer is not comfortable doing this alone, a personal trainer may be used to assist her with the physical exercise and a good vocal coach may be employed to assist her with vocal exercises.

- Swollen and dehydrated vocal cords

Due to the reduction in the female hormones, swollen and dehydrated vocal chords may be experienced, which may have an affect on vocal production (Davies, 2004: 103).

- Other symptoms (Davies, 2004; 103):
  - Loss of power
  - Loss of resonance
  - Loss of muscle power and muscle suppleness of the larynx
  - Stiffening of laryngeal cartilage
  - Loss of muscular control in the supporting muscles such as the diaphragm and abdominal muscles
  - Vocal fold thickening
  - Breathiness of tone
  - Development of tremolo
  - Vocal fatigue
  - Change in vibrato
  - Loss of accurate pitch, with an increase in scooping and wobbling.

### **The lungs**

The effect menopause has on the lungs is that the lungs decrease in their ability to hold air volume and lose their elasticity. This would create problems with breathing capacity, breath control and sound production.

### **The sinuses**

One of the symptoms of the drop in oestrogen and progesterone levels during menopause is the drying out of tissue and the reduction of mucus production.

There is evidence that this also affects the sinuses, and that women suffer more from sinusitis, asthma, allergies and migraine headaches than before they went into menopause (Mayo, *Chronic sinusitis* (2004) [Online]). Any of the following symptoms will certainly affect the singer in a negative way:

- **Sinusitis**

Information condensed from Mayo, *Chronic sinusitis* (2004) [Online].

Sinusitis is an infection of the sinus cavities caused by bacteria. It may be preceded by a cold or allergy attack, which causes the sinuses to become inflamed and unable to drain. Frequent sinusitis may become chronic, which can cause damage to the sinuses and the cheekbones and this may require surgery.

The symptoms of sinusitis are:

- Facial pressure and facial pain
- A thick yellow-green nasal discharge
- Nasal congestion
- A fever, headache, bad breath, or pain in the upper teeth.

To prevent sinusitis occurring during a cold or an allergy attack it is advisable to take the following precautions:

- Use an oral or nasal decongestant to clear the sinuses
- Regularly blow the nose gently
- Drink plenty of fluids to keep the nasal discharge thin
- Avoid air travel if possible and, if not, use a nasal decongestant prior to the flight

- Avoid coming into contact with substances and situations that might trigger an allergy attack.

Bacterial sinusitis is treated with an appropriate antibiotic. In addition, a decongestant and oral or nasal spray may also be used. Steam inhalation and the use of saline nasal sprays can also be effective. Chronic sinusitis needs to be treated with an intensive course of antibiotics and surgery may be indicated if a physical obstruction is causing the condition.

- **Asthma**

Information condensed from About Inc., *What is Asthma* (2006) [Online].

Asthma is an inflammation of the airways. It is a chronic respiratory disease that is often linked to allergies, heredity, the environment and the person's weight. The symptoms of asthma are:

- Coughing
- Wheezing
- Shortness of breath
- Tightness of the chest.

The following are the most common causes of asthma:

- Dust

This is something that none of us can avoid; there is dust everywhere, especially on big stages and sets. Personally, I have often experienced great discomfort as a result.

- Animals

Animal hair and saliva may be the cause of many allergies and can cause an asthma attack. Animals are frequently used in productions and the producer is not always sensitive to the singer in this respect. As an asthma sufferer, the candidate had to deal with this problem many times in her profession. The candidate was once asked to keep a dog on her lap while singing an aria. After a few minutes the candidate was unable to breathe any longer, let alone sing. Many singers struggle with this problem and one does not have to be an asthmatic to have an allergic reaction to an animal.

- Infection

A common cold can easily progress into bronchitis and continue into asthma. According to Dr. J. Steer (2005, October 25) the asthma symptoms would be relieved if the respiratory system could be kept free from infection.

- Breathing cold air

Breathing cold air can result in an asthma attack. See paragraph on exertion.

- Exertion

Exercise-induced asthma is usually triggered by prolonged physical activity such as doing an hour-long recital, moving around the stage in an opera, or dancing in an operetta. We normally breathe through the nose, which warms and humidifies the air, but when we exercise we tend to breathe through our mouth. This causes the inhalation of colder air. Exercise-induced asthma is a reaction by the temperature-sensitive muscle bands around the airways to the

cold air. These muscles react by contracting or going into spasm, narrowing the airway and resulting in asthma. Fortunately asthma symptoms can be controlled in the long term by taking a long-lasting bronchodilator, which usually lasts for twelve hours. A quick-acting dilator should be kept near for emergencies. To keep the body fit, indoor exercises such as swimming and walking are recommended, as outdoor activities could cause renewed allergic reactions.

- Reaction to certain medications

People with asthma tend to have an allergy to certain medications. Medical treatment has to be given if an allergic reaction occurs and this is obviously a very serious situation for the singer. The individual will have to clear each medication with their doctor, avoiding those that they are allergic to. A serious allergic reaction to medication can easily result in hospitalisation or even death.

- Workplace chemicals

Chemicals used in the workplace may cause certain people a problem, an example being the many chemicals that are used on the stage, such as set and props paint, and smoke machines. These chemicals have caused many allergic reactions in singers and are a particular problem for asthma sufferers, as they could trigger an attack.

- Cigarette smoke

Fortunately, this problem does not seem to be as prevalent as it used to be. Most public places, which are the very places that

singers work in, are designated as smoke free zones. Unfortunately there is still the occasional problem of a person smoking backstage. The candidate was once asked by a director to smoke a cigarette on stage, while she was performing, to “help the audience understand the personality of her character”. While her smoking may have made them understand the character better, their enjoyment would probably have been reduced when they heard her wheezing due to an asthma attack, instead of hearing her sing. In the end a compromise was reached and she held the cigarette with the agreement that it would not be lit. A singer who suffers from asthma should take serious cognisance of the fact. As explained before, neglected and numerous attacks may lead to emphysema, the inability to breath properly, and loss of proper breath control.

Asthma can be crippling to the singer in that it leaves the singer short of breath, which elevates the level of stress. Eventually the singer hyperventilates, which causes tension in the larynx. Tension in the larynx will, in turn, cause the vocal folds to compensate for the disorder, leading to a tired and hoarse voice. An asthma problem also leaves the singer tired and breathless, as the body is not obtaining sufficient oxygen. In menopausal women suffering from asthma, the taking of asthma medication is recommended for relief and may help the singer lead a symptom-free life.

- **Vocal cord dysfunction**

Vocal cord dysfunction usually has the same symptoms as asthma. If someone is suffering from asthma symptoms and the medication prescribed by their doctor does not relieve these symptoms, vocal cord dysfunction may be indicated. A person who expects that she is suffering from vocal chord dysfunction should undergo tests to confirm the condition and should be treated accordingly (National Jewish Medical, *About Vocal Chord* (2006) [Online]).

### **Summary of effects on the singer**

Maintaining a healthy respiratory system is essential for good singing. Unfortunately, menopause may lead to respiratory system problems that can severely affect a singer's ability to perform, unless treated.

Each element of the respiratory system that is mentioned above will have different treatments, depending on the part of the respiratory system that is affected and these treatments are usually successfully remove or reduce the symptom to manageable levels. Fortunately the contraindications of these treatments usually have little effect on a singer's ability to perform and singers can look forward to a productive and successful life in their profession, both during and beyond menopause.

In the case where changes to the respiratory system brought on by menopause cause a permanent change to the singer's voice, this can usually be managed by using a trustworthy singing coach to introduce the singer to the "new" voice she is working with.

## **The reproductive system**

Information condensed from Northrup, *The wisdom of menopause* (2001): 124-133].

### **General effects**

The reproductive system is one of the systems of the body that experiences the largest change during menopause. As menopause progresses, the reproductive system slowly becomes redundant and, after menopause, it ceases to have a reproductive function at all.

### **The ovaries**

During peri-menopause the ovaries start reducing the production of hormones, which causes the enormous change in the entire body. It influences each system of the body to slow down and therefore the symptoms of menopause appear.

Most of the following symptoms occur due to the lack of hormone production by the ovaries, although many of these symptoms may also be caused by hormonal changes and imbalances in the endocrine system:

- **Insomnia**

Insomnia is a sleep disorder and it can cause fatigue, difficulty in concentrating and irritability.

Insomnia affects the singer's body because this is a period of great change. Night sweats, hot flushes and anxiety cause insomnia and therefore the singer may suffer from fatigue, be unable to concentrate, and suffer from irritability.

She may also suffer from a lack of energy and her body's general resistance to illness may be affected, leaving her prone to infections.

Insomnia caused by hot flushes and night sweats can be treated by using hormone replacement therapy. Insomnia caused by asthma can be treated by medication that would have a long term affect on opening the bronchial tubes, such as an inhaler. Good relaxation techniques can also be developed to help the body relax and it is advisable to start a regular sleeping pattern by going to bed every night at the same time, not to drink caffeine close to bedtime or to eat a big meal and to make the bedroom as tranquil as possible. Some people treat insomnia by listening to relaxing music or sounds.

- Hot flushes

Hot flushes are a sudden sensation of burning heat spreading across the face, neck and chest. Hot flushes are classic menopausal symptoms due to the lack of oestrogen. The brain mistakenly thinks that the body is too hot and puts the heat-losing mechanisms of the body into action. The blood vessels dilate, skin temperature rises and the hot flush starts and can last up to 5 minutes. In some cases symptoms such as nausea, palpitations can accompany the hot flush.

These symptoms may make a singer extremely uncomfortable as she may already be feeling hot under the stage lighting. The fact that the flushes appear without warning is another problem and it may cause her to have a lack of concentration and make her feel insecure, as she may feel that she is not in control of her body and therefore not in control of her vocal ability. Palpitations can also cause her to hyperventilate and this will affect her

breathing, which in turn affects the production of sound. Fear, insecurity and anxiousness are not the kind of emotions the singer wants to feel when facing an audience. These emotions may lead to a performance that is full of mistakes, a lack of energy and poor vocal production.

The condition is usually treated with HRT, exercise and a healthy diet. The wearing of cotton clothing helps and it is advisable to drink plenty of water. With the aid of the proper treatment, the hot flushes should disappear.

- Irregular periods

As the woman moves into the peri-menopausal stage of her life, her periods may start to change and may become heavier or spotting may occur. There may be some lengths between periods; some periods may become longer or shorter, depending on the person. This pattern of irregular periods may continue for many years. For a woman to be considered to be in the menopause stage, her periods must have stopped for at least a full year.

During the peri-menopausal phase a woman may feel insecure due to the changes being experienced in her body and it is advisable for her to speak to her doctor and to go for regular pap smears at least one a year. This regular examination should help to put her mind at rest, as she and her doctor will be aware of any problems well in advance and will be able to address them in a timely manner.

Although irregular periods are not dangerous, they may leave the singer with some problems that cause inconvenience. Generally the singer has a good idea as to when she can expect her period and can plan accordingly. It is usually

better to schedule a performance that does not fall on the dates of her period, as menstruation causes pain in the abdomen and lower back as well as a lack of support from the abdominal muscles due to water retention. The singer may also experience vocal problems as the vocal cords may become swollen as a result of hormonal changes. Irregular periods usually tend to appear as a result of peri-menopause and the singer cannot plan around them as she has no idea when they will occur. This may result in her being forced to perform when she is experiencing pain and discomfort and struggling with a lack of muscle support. An irregular period may also cause embarrassment as the singer might not be prepared for it.

Treatment prescribed for irregular periods during this time is HRT, calcium replacement, maintaining a healthy diet, and regular exercise, which should help to regulate the periods to a certain extent.

- Night sweats

One of the most common symptoms in menopausal women is night sweats. The sufferer wakes up wet, cold, and clammy and usually has to get out of bed and change bedding as well as night clothes. Night sweats are a common cause of insomnia and leave the person fatigued, irritable, and suffering from a lack of concentration.

The main treatment for night sweats is HRT. To aid with this problem and to help promote a good night's sleep, the following tips may be helpful:

- Wear cotton nightwear
- Wear clothing in layers, so it can be removed
- Spray the body with water to lower the temperature of the skin

- Drink lots of cold fluids
- Try relaxation exercises
- Supplement the diet with evening primrose oil

### **The vagina**

The lower oestrogen levels cause a decrease in blood flow to the vagina and this affects the lubrication which in turn leads to the inner lining of the vagina becoming thinner (vaginal atrophy). This causes soreness, itching, painful intercourse, bleeding after intercourse, and can sometimes result in vaginal infections which are painful and uncomfortable.

The fact that a singer is experiencing painful intercourse due to vaginal atrophy may cause her to feel sexually unfulfilled and this could lead to stress and problems in her relationship with her partner. Stress and frustration will also have a negative effect on her performing, as the singer needs to be relaxed at all times when working. Stress may cause tension in the neck muscles, which in turn could lead to vocal discomfort and stress-induced incorrect breathing, due to the body not being able to breathe with a relaxed abdomen and thorax.

Treatment is normally in the form of an oestrogen cream or oestrogen replacement therapy.

### **The cervix**

Due to the decrease in oestrogen levels during menopause the cervix shrinks. The cells of the cervix are dependent on oestrogen to mature and accumulate as multiple layers of flat cells. During menopause this fails to happen, with the result that the lining in the cervix becomes thin and atrophic.

## **The uterus**

Information condensed from National Institute of Child Health, *Fast facts about Uterine Fibroids* [Online].

Similar to the changes that happen in the cervix, the uterus undergoes changes as the ovaries stop producing hormones. The uterus lining (endometium) becomes thinner and the uterus itself becomes smaller. A problem that many perimenopausal women suffer from is uterine fibroids. Uterine fibroids are tumours that grow in the wall of the uterus. Some fibroids grow just underneath the uterine lining, while others grow between the muscles of the uterus and some grow on the outside of the uterus. These fibroids can cause:

- Heavy bleeding of painful periods
- Bleeding between periods
- Cause pelvic pressure
- Frequent urination due to the fibroids pushing on the bladder
- Pain during sex
- Lower back pain
- Infertility or miscarriages

Should a singer suffer from this condition, she may experience difficulty when she has to perform. The heavy bleeding makes it very difficult to be on the stage for any length of time and the loss of so much blood leaves her very tired and anaemic. The fatigue caused by heavy bleeding can lead to her not having sufficient energy to move easily, to support her voice, and to project her emotions to her audience. Lower back pain can cause difficulty in vocal support and the “full” feeling she has due to pelvic pressure may cause difficulty in breathing

properly and in using her abdominal muscles to the best of her ability. A frequent feeling of wanting to urinate may be the cause of her having a lack of support and concentration. Bleeding between periods will result in her not to be able to plan her performance schedule around her periods. This might lead to great inconvenience for her, as well as having to deal with a body that is not in top condition when she has to perform.

Uterine fibroids cannot be treated, although they can be surgically removed if the symptoms become impossible to live with. If the symptoms are not severe they can be left as they are, as they are not cancerous and tend to become smaller after menopause.

### **Summary of effects on the singer**

The reproductive system is an integral part of any female singer's anatomy and has a significant effect on the singer. The experience of menopause produces severe changes in the reproductive system. Fortunately all of these changes can be effectively managed using HRT, taking dietary supplements, following a correct diet, maintaining a sufficient level of exercise, and undergoing surgery when necessary (Rutherford, *The menopause* (2006) [Online]).

There is no reason why changes to a singer's reproductive system that are caused by menopause should prevent her from leading a successful singing career.

## **The cardiovascular system**

Information condensed from United States Department of Health and Human Services, *Heart and Cardiovascular Disease* (2002) [Online].

### **General effects**

There are a few facts that women should be made aware of when it comes to heart disease:

- After menopause, women are more at risk of suffering a heart attack than men
- The risk of heart disease and stroke increases with age
- Smoking lowers the age of a woman's first heart attack and it raises the risk of another heart attack
- Women in their pre-menopausal stage who suffer from diabetes and who smoke are more prone to heart attacks
- More women die of a heart attack than men
- African women are more prone to cardiovascular disease than Caucasian women
- Regular physical activity and maintaining a healthy weight reduce the chances of a heart attack.

As prevention is always better than cure, it is advisable for women to take care of themselves so that cardiac and vascular disease does not happen. Some ways to prevent these diseases include:

- Following a diet low in saturated fat and cholesterol, rich in whole grains, fruit and vegetables
- Getting daily exercise

- Maintaining a healthy weight
- Not smoking
- Controlling diabetes, if relevant
- Taking medication prescribed by a doctor

A heart attack or a stroke is generally preceded by the following warning signs:

- Discomfort in the centre of the chest; the pain can come and go and resembles an uncomfortable pressure
- Discomfort in other body areas, such as the back, neck, jaw, one or both arms, and the stomach
- Shortness of breath, with or without chest discomfort
- Nausea, light headedness, and breaking out in a cold sweat.

The warning signs of a stroke are:

- A sudden numbness or weakness in the face, arm, or leg on one side of the body
- Sudden confusion, trouble speaking or understanding
- Sudden trouble with vision in one or both eyes
- Sudden trouble in walking, dizziness and a loss of balance and coordination.
- Sudden severe headache

### **Cardiovascular disease**

Statistics show that the number one killer of women over the age of fifty is cardiovascular disease (CVD), due to the level of lipids (blood fats) in the blood.

This seems to be due to the fact that oestrogen protects women against CVD during their child bearing years. After menopause the risk of CVD increases as the oestrogen levels drop. Menopause changes the level of lipids in the blood. These lipids are a source of fuel to the cells; it is a waxy substance that is found in all parts of the body. It makes the cell membranes, some hormones and also Vitamin D. Cholesterol is one of the types of lipid that exist in the body and cholesterol can be further divided into two types:

- HDL Cholesterol (high density lipoprotein)

This cholesterol is seen as “healthy cholesterol” as it helps to clean the bloodstream.

- LDL Cholesterol (low density lipoprotein)

This encourages the fat to accumulate on artery walls. It is seen as the “bad” cholesterol as the fat build-up can lead to stroke, heart attack and death.

In menopausal women HDL decreases and LDL increases as a result of oestrogen deficiency. This can be fatal if not treated.

Cardiovascular disease is a disease of the heart, arteries, veins and capillaries in a person’s body. There are many types of cardiovascular diseases, such as:

- **Arteriosclerosis**

Arteriosclerosis is a disease which thickens and hardens the arteries. As a result, the inner walls of the arteries become narrower due to the deposits of cholesterol. High levels of cholesterol can increase the risk of arteriosclerosis.

- **Coronary artery disease**

This is the most common form of heart disease and it affects the coronary arteries of the heart. It can cause angina (chest pain) and heart attacks.

- **Angina**

When some part of the heart does not receive enough blood a pain or discomfort may be experienced in the chest. This is known as angina. Physical exertion is a very common trigger for angina. Fortunately angina seldom causes permanent damage to the heart.

- **Stroke**

A stroke is caused by a lack of blood flow to the brain due to a blood clot. It can also be caused by bleeding in the brain due to a broken blood vessel.

- **High blood pressure (hypertension)**

Blood pressure is the force with which the blood is pumped from the heart against the walls of the blood vessels. Hypertension can cause heart failure, kidney failure, and a stroke. Many women suffer from hypertension and it seems to be more common and more severe among black women.

- **Heart failure**

Heart failure occurs when the heart is not able to pump blood through the body. There are two types of heart failure, systolic heart failure and diastolic heart failure.

- **Fatigue**

Fatigue is a very common experience for women in menopause. Some suffer from mental fatigue and others from physical fatigue. Mental fatigue results in a feeling of a need to sleep all day and any activity takes

enormous energy to perform. Fatigue during menopause may be a result of the hormonal imbalances of oestrogen and progesterone. It may also be caused by insomnia, due to the person suffering from night sweats and hot flushes (Taylor, *Menopause* [Online]).

### **Treatment of cardiovascular disease**

The treatment of cardiovascular disease includes:

- Medication to prevent blood clots, such as aspirin
- Medication to improve the flow of blood through the narrowed arteries
- Medication to control hypertension (high blood pressure) if needed
- Medication to lower the presence of high cholesterol
- Catheter-based procedures and surgery, should the condition require it.

Hormone replacement therapy seems to be an area of much discussion, as the information available shows a high concern to the fact that HRT might increase the risk of heart attacks. It is up to the individual to discuss the option of HRT with her doctor, who will take her personal medical condition into consideration and will then make a decision as to whether HRT is a suitable treatment for her or not. Discussion with a doctor will also reveal that there are some drugs available that can be used as an alternative to oestrogen.

### **Summary of effects on the singer**

In my experience, a singer with cardiovascular system problems brought on by menopause, such as high cholesterol, hypertension, and/or diabetes, will usually find performing difficult. CVD is often accompanied by excessive weight gain,

which makes movement cumbersome. Singers who perform in this condition are often exhausted afterwards and may require a number of days to recover. There is usually a risk of a heart attack or a stroke if these problems are not treated, which will certainly put the singer in a position where they will not be able to perform.

It is advisable for the singer to keep her weight at a healthy level, to eat a diet that suits her medical condition, to exercise regularly, and to take the medication that her doctor has prescribed for her. This should help to get the situation under control and to keep it that way. If these guidelines and her doctor's advice are followed, she may well be able to return to a rewarding singing career.

## **The central nervous system**

Information condensed from Epigee, Menopause and Depression (2005) [Online].

### **General effects**

The general symptoms of menopause seem to have much more of a psychological than a physiological effect on the central nervous system. Symptoms such as depression, stress, migraine headaches, nervousness, insomnia, irritability and palpitations are some of the effects that menopause has on the body. Some of these symptoms may have serious consequences if they are not addressed.

### **Depression**

Due to the hormonal changes in the body during menopause, many women are afflicted with several psychological problems; one of these being depression.

The feeling of inability to cope with all the physical changes taking place and the loss of ability to carry a child are some of the causes that may lead to

depression. Decreases in the levels of serotonin in the central nervous system may also cause severe depression. Some of the symptoms of depression are (Department of Psychiatry, *Mood Disorders* [Online]):

- Feelings of sadness
- Feelings of hopelessness
- Irritability
- Tearfulness
- Anxiety
- Lack of motivation
- Lack of energy (fatigue)
- Poor concentration
- Insomnia or hypersomnia
- Recurrent thoughts of suicide

Depression during menopause can be treated by the following methods (University of Michigan, *Understanding Depression*, (2006) [Online]):

- Oestrogen therapy

As previously discussed, oestrogen helps menopausal women with the relief of various problems during menopause, as well as with depression.

- Antidepressants

There are many varieties of prescription antidepressants available on the market today. Many of these regulate the serotonin levels in the brain and therefore lift the depression. Adverse side effects of a tremor, dry mouth, and stiff muscles, with shuffling gait have already been mentioned.

- Psychotherapy

In combination with the correct medical treatment, psychotherapy can be a very effective way to overcome depression during menopause.

- Promote sleep

Not getting enough sleep can make depression worse. A regular sleeping pattern can help to promote sleep. This can be developed by going to bed and rising every day at the same time. It also helps to have a warm bath before bed time for relaxation. Another great help is to listen to relaxing music.

- Healthy diet

Eating a balanced diet and regular meals is very important. This, plus taking extra calcium and vitamins (as previously mentioned), will help to relieve the symptoms of depression. Limiting the intake of caffeine, chocolate and alcohol may also help.

- Social changes

Spending time with friends, taking a break from every day responsibilities, and doing the things that one enjoys are all ways to cope with depression and usually have very positive results.

## **Stress**

Information condensed from Giblin, *Managing Stress* (2004) [Online].

Menopausal stress is mainly caused by all the physiological, psychological, and social changes that are taking place in a women's life at menopause. Stress can make your heart beat faster and can cause muscle tension and rapid breathing. If stress continues over a long period of time and is not managed, it can be detrimental and wear the person out physically and psychologically.

Stress is a great problem for the singer in general and when peri-menopause and, later, menopause occurs, that stress may become even worse. Stress inhibits the singer's performance. It creates tension in the body and especially in the neck and shoulders that causes problems in vocal production. The voice may appear smaller and intonation problems can occur, as well as problems singing notes in the extreme ranges of the voice. Stress inhibits the singer's breathing and therefore the control of the voice is also affected. It leaves the singer short of breath and unable to carry the sound through the phrases, as desired. Stress causes irritability and a lack of concentration. These two factors may influence the singer to make mistakes or have memory lapses. These are only a few problems the singer may experience when suffering from stress. It is therefore advisable for the singer to make sure that she finds a way to manage her stress, whether she does it herself, using some of the guidelines given, or whether she goes for professional therapy. It is essential that she effectively solve the problem of stress in order for her to continue her performing career.

To eliminate the stress caused by the physiological changes taking place, the following guidelines may be helpful:

- Keep a diary of your menopausal symptoms and share these with your doctor
- Talk to your partner or family about what is happening to you
- Develop a plan for yourself on how you can manage the changes happening to you

- Follow a diet that is the most beneficial for your condition, whatever it may be
- Follow a regular exercise pattern
- Take care of the chronic ailments you may have, be it asthma, hypertension or diabetes.

To eliminate stress caused by psychological changes taking place, the following guidelines may be helpful:

- Some women may suffer from psychological problems because menopause has left them infertile and the other symptoms of menopause have changed their sex life dramatically. It may be good to discuss this with your partner to see if there is not a way you can overcome these feelings together, or with a close friend who has been through the same experience
- Professional counselling may be required
- Starting a new hobby or spending time with friends can be effective ways to manage stress brought on by social changes

### **Migraine headaches**

Information condensed from United States Department of Health, *Migraine Headaches* (2004) [Online].

A migraine headache is a severe pain in one or sometimes both sides of the head. The pain can be accompanied by nausea and vomiting, sensitivity to light and sound. This headache can occur any time of the day or night.

The causes of migraine headaches are:

- Chemical changes in the brain
- Blood flow activity in the brain; the narrow vessels in the brain expand and press on nerves which cause pain
- Genetic predisposition
- A drop in hormones due to periods or menopause
- Hormone replacement therapy may be the cause of migraine headaches but this link has not been proven

Migraine headaches can leave the singer completely incapable of performing. Because of increased sensitivity to light and sound, the singer may not be able to work, as her stage situation is full of extremely bright lights and very loud sounds from the other voices and instruments. As migraine headaches are sometimes accompanied by vomiting, this may have an effect on the vocal cords as the acid coming up from the stomach would cause the voice to get irritated and hoarse. Migraine headaches also act to impair the singer's movements and this factor can severely impair the singer's ability to perform as the singer moves around constantly. A severe migraine headache makes it almost impossible to deliver the high volume of sound that singers are often required to produce during a performance.

The treatment of migraine headaches includes:

- Medication for the pain
- Managing stress as much as possible - this may limit the pain
- Massage may relieve the pain.

Prescribed medication should be taken as directed by the doctor, as incorrect dosage or incorrect usage may influence the effectiveness of the medication.

### **Mood swings**

Information condensed from United States Department of Health and Human Services, *Mood swings* (2004) [Online].

Mood swings are one of the first signs of peri-menopause and are caused by a hormone imbalance. The serotonin levels in the brain are disturbed and this leads to mood swings. Emotions become more intense and there may be signs of extreme irritability, blatant rage, concentrated anxiety, nervousness and depression. The presence of other menopausal symptoms such as hot flushes, incontinence and night sweats may also contribute to mood swings.

Mood swings may influence a singer's ability to perform if she is not able to control them. She works with many people every day that are also under stress and the pressure to perform may cause her to become agitated, emotional and unable to concentrate. This in turn could affect her ability to produce the sound that she wants and could influence her breathing.

The treatment suggested to relieve mood swings is to:

- Do relaxation exercises, such as yoga
- Get the support of friends and family or a support group who can help in difficult times
- Eat a diet low in caffeine

Too much caffeine aggravates the condition. Drink decaffeinated teas (such as passion flower or chamomile) or warm milk, which contains a

component tryptophan, which helps to raise the serotonin levels in the brain.

- The singer is advised to ask her general practitioner for advice and/or to refer her to a psychiatrist regarding mood-stabilizing medication, of which a variety of effective products are available.

### **Bell's Palsy**

Information condensed from BUPA Foundation, *Bell's Palsy* (2006) [Online].

Bell's Palsy is a condition resulting from paralysis of the seventh cranial nerve, which may leave the muscles on one side of the face permanently paralyzed if not diagnosed and treated urgently. As the muscles around the eyes are also affected by this paralysis, continuous tears or watering of the eyes may be experienced.

The singer will not be able to control the muscles of the mouth properly to form the required sounds. She will also not be able to lift the cheek muscles, the upper lip and the soft palate inside the mouth, which is needed in order to create the required resonance. As vowel sounds depend on the shape of the mouth she will experience difficulty in producing these sounds. She may also struggle with fact that her eye on the paralyzed side of her face may water continuously.

The treatment suggested to relieve Bell's Palsy is:

- Treatment by a course of steroids within the first 24 hours of the onset of the symptoms
- The condition usually improves and may disappear completely over time

### **Trigeminal Neuralgia (shingles)**

Information condensed from Trigeminal Neuralgia Association, *What is Trigeminal Neuralgia* (2006) [Online].

Trigeminal Neuralgia is a disorder of the trigeminal nerve, which is the fifth and largest cranial nerve. The disease usually occurs when the singer's energy levels and general resistance are low and it causes episodes of intense, stabbing, electric shock-like pain in the affected part of the body. It usually occurs in the face and affects the lips, nose, scalp, forehead, and upper and lower jaw, although it may occur anywhere on the body.

The Trigeminal Neuralgia Association states that Trigeminal Neuralgia is considered to be the most painful condition known to medical practice. A severe case of this disease will make it impossible for the singer to perform.

Treatment is usually by means of anti-convulsant drugs. Some anti-depressant drugs, which may also have pain relieving effects may also be used. The condition usually improves gradually but this may take up to 18 months in severe cases.

### **Summary of effects on the singer**

Changes to the central nervous system brought on by menopause affects the ability of a singer to perform. Depression, stress, headaches and mood swings may strongly influence the singer's performance if she is unable to control them.

Fortunately these symptoms are usually easily managed with modern medication, by using stress management techniques, by following a good diet, and by following a good exercise regimen.

## **CHAPTER V**

### **INTERVIEWS WITH SINGERS**

As part of my research, I questioned ten singers between the ages 45 and 70 to establish what their experiences were as they were going through peri-menopause, menopause and post menopause. My questions to them were as follows:

1. How old are you?
2. Have you had any children?
3. Have you had a hysterectomy?
4. Have you experienced any peri-menopausal symptoms?
5. Are you in menopause already?
6. Are you post-menopausal?
7. What physical problems have you experienced due to peri-menopause, menopause or post-menopause?
8. How did these problems influence your performance as a singer?
9. What psychological problems have you experienced as a result of peri-menopause, menopause or post-menopause?
10. How did these problems influence your performance as a singer?
11. Were you on any medications for the symptoms you suffered?
12. How effective was the medication?

13. How did the medication affect you as a singer?
14. Have you had any surgical procedures performed as a result of peri-menopause, menopause or post-menopause?
15. How affective was the surgery in resolving the problem?
16. Are you still performing professionally?
17. Has the experience of going through menopause changed your performance as a singer in any way?

Of the group of singers that I interviewed, five had had children. Five (A, B, C, D and E) were in the peri-menopausal stage, three (F, G and H) were menopausal, and two (I and J) post-menopausal. Only two of the women (E and F) had had experiences that lie outside the norm. Both of them had had an abrupt menopause due to a hysterectomy, which was performed as a result of uterine fibroids that were causing very heavy bleeding. As a result of the bleeding they were fatigued and suffered from anaemia. It made their lives very complicated and they were incapable of performing. Both received hormonal replacement therapy after the surgery. E (29 April, 2005) has fully recovered and is active as a performer and as a full-time singing teacher. She feels healthy, confident, relaxed, content, and much more in control of herself than before the hysterectomy. She told me that she can now enjoy her music and her career, as she feels like a whole person.

F (19 May, 2005) is no longer active as a performer. She experienced psychological problems due to the fact that she is childless and she had to come to terms with the fact that she will never be a mother. Although she received hormonal replacement therapy that helped for most of the menopausal symptoms, she is still suffering from depression and fatigue and shows signs of osteoporosis. She decided to conclude her performing career

due to her psychological health and is receiving treatment for both depression and the symptoms of osteoporosis.

Of the group who are currently in the peri-menopausal stage, all are experiencing symptoms of mood swings, fatigue, dry skin and vaginal atrophy. They are all noticing that it takes more energy to perform. Their energy levels are lower, their voices have dropped in tone, and they have to vocalise more frequently to keep the voice agile. A similar observation was made by Davis (2004) [Online]. They have to concentrate more on exercising the body, as the abdominal muscles seem lethargic. Some of them have gained weight, resulting in their becoming tired more easily and having to work harder at controlling their breathing and supporting their voice. The majority of the peri-menopausal group is exercising regularly, following a healthy diet and taking vitamins and calcium daily. Only one person in this group (A, 15 April, 2005) is presently using a natural oestrogen supplement; her symptoms of mood swings and painful irregular periods had become a problem to her but the treatment is proving to be successful. She no longer feels “over-emotional” and, although her periods are still irregular, she does not suffer from severe pain during her menstruation as she did before.

Two of the singers in peri-menopause, B (21 September, 2005) and C (15 July, 2005) are experiencing pre-menstrual migraine headaches. B uses over-the-counter pain medication, which provides some relief, and C uses a prescription medication, which seems to be much more successful. Both of them find it difficult to perform when they experience migraine headaches and, if at all possible, they avoid performing while ill. C also suffers from depression, severe stress, uterine fibroids, and heavy bleeding during menstruation. As a result of the heavy bleeding, she is fatigued and anaemic. Her doctor

is treating her with an iron supplement and she is keeping to a specific diet to help with the anaemia. She was given the option of a hysterectomy, which would remove the uterine fibroids and stop the heavy periods, the alternative being to wait until she moved into menopause, with the hope that the fibroids would naturally disappear. She decided to take the latter option, as she feels that, in addition to a desire to avoid the physical trauma of the surgery, the psychological trauma of a hysterectomy would not be something that she would be able to deal with at this stage in her life. As the peri-menopausal symptoms are not severe, she is not on any hormonal replacement therapy but she is taking a daily calcium supplement, following a healthy diet, and exercising her body and voice daily. To treat the depression she is taking prescribed antidepressant medication. This medication relieves the depression but she feels it has taken away some of the sparkling quality in her performance. However she chooses this above the depression which leaves her incapable of performing. She is a very active performer and enjoys her profession immensely.

The singers in the peri-menopausal group are all experiencing slight vocal changes. Their voices have become more mature sounding and they have to spend more time warming up vocally than before. Their voices take longer to gain their usual agility and their bodies take longer to feel energised enough for a performance. Two of the singers B (21 September, 2005) and D (16 December, 2005) have noticed that the top range of their voice has dropped approximately one tone, with the bottom range showing a drop of two tones.

Singer H (7 November, 2005) in the menopausal group commented that her voice has become much richer in timbre. She is a mezzo-soprano and her voice has become fuller and easy to work with. She is very relaxed and confident and is enjoying her performing

enormously. She occasionally suffers from insomnia, but finds that listening to music that calms her and doing relaxation exercises addresses the problem.

The two singers that are in the post-menopausal stage are both retired from performing. I (8 November, 2005) is still active as a singing teacher and explained to me that she is very fulfilled in this role. J (10 October, 2005) retired while she was in her menopausal stage. She felt she lacked the energy, concentration and confidence with which she usually performed and felt that she was not offering her audience her best anymore.

Many people feel that their career comes to an end when they reach menopause. This may be the case for some singers but for others the future still holds many rewarding years of performing. The singer who works at staying in good health, getting the correct treatment for the symptoms she is suffering from as a result of menopause, and exercises her body and voice can perform until a high age. For those singers who experience severe vocal problems due to hormonal changes, it may be a good idea to take a period of time off from performing and to work with a reputable vocal teacher. Going back to the basics may aid the voice and the body to return to that place where the singer feels comfortable with her breathing and vocal technique and abilities. This may restore her confidence in her instrument and in its capabilities and she will be able to choose repertoire that she enjoys performing. It is also advisable for the singer who feels that she lacks energy at times to space her performances in such a way that she gets plenty of time to rest between performances and to choose repertoire that does not require too much energy to perform.

The famous singer, Christa Ludwig, experienced a difficult menopause, but she received treatment for her symptoms, worked through her vocal problems and only retired from performing when she was in her late sixties (Bernstein, 2000).

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## **CHAPTER VI**

### **INTERVIEWS WITH MEDICAL PROFESSIONALS**

I conducted interviews with two gynaecologists, two psychiatrists and two otolaryngologists (ear, nose and throat specialists). My questions to them were:

1. What treatment would you prescribe to a patient experiencing symptoms of peri-menopause, menopause or post-menopause?
2. In your opinion, could the treatment have any negative affect on a singer's performance?
3. What treatment would you prescribe to a patient experiencing psychological difficulties as a result of menopause?
4. In your opinion, could the treatment have any negative affect on a singer's performance?

According to the gynaecologists, Dr. R. Johnson (18 July, 2005) and Dr. Y. Huet-Vaughn (17 May, 2005), most women who experience menopausal symptoms are treated individually, according to their specific needs, to specifically address the symptoms that they are experiencing. Most women use hormone replacement therapy and this has proved to be very successful. There are women who are hesitant to use HRT, as it may cause certain cancers, but there are plenty of natural hormonal supplements available for

those who have these concerns and who want to take HRT. The gynaecologists were not sure what influence HRT would have on the voice, but explained that they had never had any patient complaining of vocal problems due to the treatment. They would only consider recommending surgery if it was absolutely necessary. In the past hysterectomies were performed very often but there is now far more willingness in the medical profession to consider alternative treatment before recommending surgery.

The general consensus was that they knew of very few cases of women who were suffering from psychological problems due to menopause that need the attention of a psychiatrist. According to the psychiatrists I spoke to, K (20 July, 2005) and L (22 July, 2005), most women experience depression, anxiety, stress and insomnia during menopause, but this can usually be treated successfully by a general practitioner prescribing an anti-depressant or by attending counselling. The course of action that was recommended for women showing more serious symptoms was to refer them to a psychologist or psychiatrist, who would treat the person accordingly although, in their experience, they had never had to refer women to a psychiatrist for treatment of severe psychological problems due to menopause. They did confirm that the performer who is using anti-depressant medication may feel less energetic and less “sparkling” due to the fact that the medication causes the emotions to become more even. The performer would not experience the extreme lows and highs that she would be accustomed to feeling while not taking the medication.

The otolaryngologists, Dr. J. Steer (25 October, 2005) and M (23 November, 2005), had had no personal experience with a patient suffering from severe vocal problems due to menopause. They did, however, notice vocal fatigue, stress in the laryngeal muscles, and

hoarseness due to menopause. These problems usually occurred because the person was tired and the body was fatigued due to other symptoms such as insomnia or stress caused by general problems in their life. This fatigue and stress influenced the laryngeal muscles and caused hoarseness. Their opinion was that hormone replacement therapy should not have any negative affect on the vocal folds. They noticed that singers who were using birth control medication actually benefited from the treatment and would expect HRT to have the same affect due to the extra oestrogen. They advised that there were certain medications that might cause the voice to become lower, namely medications containing male hormones. They advised singers to discuss other options with their doctor before taking this medication as the results would be irreversible. Their experience was that patients who did suffer from diseases of the thyroid were treated successfully, with no negative affect on the vocal folds. Their advice was that singers educate themselves in the function and use of their instrument and that they do not abuse the voice, especially at a very early age. Their opinion was that the most damage done to the voice happens while the person is young. They felt that if the voice was taken care of from a young age, there should be very limited or no complications when menopause arrived.

Both concurred that a singer should be able to continue to perform successfully until well into her sixties, as long as the correct medical treatment was followed for menopause, the correct vocal technique was used, a suitable repertoire was chosen, and a healthy body was maintained.

## **CHAPTER VII**

### **CONCLUSION**

During this study it became clear to me how important it is to take good care of our bodies from an early age. Not only should healthy diet and regular exercise be part of daily living but we should all strive to maintain a healthy mental state.

As a singer who may eventually become a singing teacher, I would recommend that singing teachers encourage their students or singing colleagues to maintain a healthy lifestyle and to especially take care of their instrument, as it is irreplaceable. A prerequisite to maintaining a healthy voice is to ensure that the body and spirit is maintained in a healthy condition.

If a teacher encounters a student or colleague with vocal difficulties during the pre-, peri-, or post-menopausal periods, it is advisable to take her back to the basics, as she is very likely to be experiencing the problems of getting to know a new voice. She will need to feel “safe” with this new instrument and will therefore need to be assisted in building up confidence in working efficiently with what is available to her. When going back to the fundamentals of singing, it is advisable to concentrate on breathing technique in order to tone and strengthen muscles that may have been affected by atrophy associated with menopause. Vocal exercises should be chosen that help her to reattain the correct placing

of the voice and to regain the vocal agility that may have been lost. It is also important that the student begin working on an appropriate repertoire – one which she feels comfortable with and that assists her to regain her confidence.

International singers such as Christa Ludwig felt that her voice was very fragile during menopause and was afraid to sing a forte tone. She never felt sure what her voice was going to do. She tried various hormone related medications and eventually found a drug called Ovestin that worked for her.

Brigitte Fassbaender, a mezzo-soprano refers to the changes brought about by menopause as "horrible vocal impositions". She feels that many singers stop singing too early because menopause is rarely discussed. When she went into menopause she stepped into a different repertoire and started directing.

Another soprano, Evelyn Lear, withdrew from the stage completely during her mid forties, found herself a good singing teacher and rebuilt her technique from the ground up. She made a triumphant comeback a few years later and sang until she was over 60. She never used HRT (Bernstein, *Is the opera house hot or is it just me?* (2000) [Online]).

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