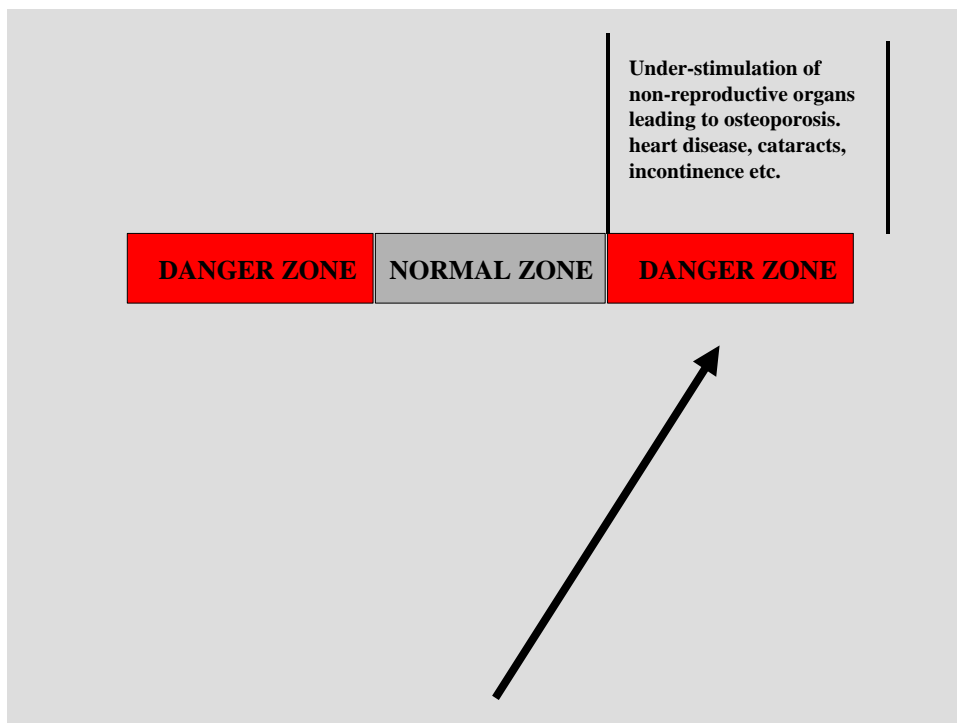


Problems of the menopause – ‘too little’ estrogen



Here we look at the problems of ‘estrogen deficiency’ affecting women after menopause

The biology of menopause

Menopause literally means a *pause* from *menstruation*. It marks the end of a woman's reproductive activity. It comes about because the ovaries finally have run out of eggs to ovulate. With no further ovulations, the level of estrogen production in the ovaries falls away, with overall estrogen levels in the blood falling by about 80%. Once menopause arrives, most of the estrogen remaining in the body derives from a woman's fat, with small amounts being contributed by lowly-performing ovaries.

Menopause means the end of most of those reproductive problems that beset the younger woman and that we looked at in the previous section disappear. Menopausal women do not suffer uterine fibroids, PCO, endometrial hyperplasia, endometriosis, cyclic mastalgia, menorrhagia or PMS, because the fuel that drove these problems – estrogen – has been lowered to a level that will not support the survival of the reproductive tissues. Unfortunately, problems such as breast cancer and ovarian cancer still remain potential problems after menopause, largely because often these are problems that begin in the pre-menopausal years and, once established, don't need high levels of estrogen to drive them.

But the bigger challenge for the menopausal woman is not with her reproductive tissues, but with the rest of her body. At this stage of her life the focus of estrogen switches to the 'low demand' parts of the body such as the brain, bones, skin and cardiovascular system. Despite the fact that these parts of the body don't have a particularly high demand for estrogen, an 80% drop in steroidal estrogen levels inevitably has to have some impact on their vitality and function. It would be unrealistic to expect no loss of function, because we are, after all, expected to age. But the issue is whether we should expect to experience (as the great majority of Western women are) the consequences of a waterfall-like drop in estrogen levels (with its premature ageing outcomes), or a slow stream-like fall that allows the non-reproductive parts of the body to maintain reasonable function well into old age.

For the younger woman, we considered the irrationality that general bodily functions should be disturbed to the point of crippling pain or bloating or severe headaches or severe depression because of her menstrual cycle. Equally, it makes no sense that those same bodily functions should be disturbed in an older woman because her menstrual cycle has stopped. Yet that is what is happening. About the same proportion of women experience the consequences of an imbalanced estrogen system after menopause as they do before menopause. The difference is that one set of problems is due to 'not enough' estrogen, while the other is the result of 'too much' estrogen.

Menopause is such a large topic that before we look at the adverse consequences of menopause, we need to understand the underlying biology of menopause - what causes it and why we have it. Then, in the next chapter we will go on to look at the consequences of menopause to a woman's wellbeing.

The 'terminology' of menopause

Before we go any further we need to understand the terms used to describe menopause. Often the terms that doctors use aren't necessarily the same ones that the general public use, and so it might also help to follow the rest of this chapter if we put some common terms into context.

The terms 'pre-menopausal', 'peri-menopausal', 'menopausal' and 'post-menopausal' are rather arbitrary as we are talking about a continuum that covers most of a woman's life.

Pre-menopause essentially means that stage of life when there is regular ovulation and menstruation.

Peri-menopause means that time from when estrogen levels begin to decline (usually in a woman's late-30s to early-40s) up to the time that menstruation stops completely. The old-fashioned term is climacteric (from a Greek word meaning to "step on a ladder" because it represented a new phase in a woman's life).

Menopause refers to the time immediately surrounding cessation of menstruation and usually covers the time when a woman's body is experiencing acute estrogen withdrawal.

Post-menopause generally refers to the rest of a woman's life once her periods have stopped for one year.

Most women's awareness of their changing hormonal status as they approach menopause is limited to a 2-4 year period that straddles the final part of the peri-menopausal phase (when a woman still has her periods, even if those periods are becoming infrequent and irregular) and the early part of the true menopausal phase (no more periods). For some women, this period of change-over as the body re-adjusts to its changing role and new hormonal status can go on for as much as 10-15 years, but for most women it fortunately is much shorter than that. The old-fashioned term for this period of adjustment and change was 'change of life'. The term 'menopause' is often used by many women and by the media in place of the 'change of life' term. But in reality, when we talk about outcomes of menopausal such as hot flashes and mood swings, we are referring to the peri-menopausal and menopausal phases; when we talk about long-term menopausal outcomes such as osteoporosis, we are referring to the post-menopausal phase.

The cause of menopause

Menopause comes about because the eggs in a woman's ovaries stop maturing. A woman is born with the potential to make about 2 million eggs, although most of these immature eggs (follicles) are destined to die before they ever mature. It is these follicles that are the main source of estrogen in the body.

During childhood these follicles are fairly dormant, although they are producing small amounts of estrogens that are sufficient to keep the low-demand non-reproductive tissues satisfied. The big increase in estrogen output only begins when the follicles start to mature to form an egg at the time of puberty. The messages to the follicles to begin this process of maturation come from the brain in the form of hormones such as follicle stimulating hormone (FSH). Under the influence of FSH, some of the follicles start to mature about the age of 10. It will be some years before any of them go the whole way and produce an egg, but even going only halfway is enough to produce an increasing level of estrogen to drive the development of the female reproductive organs including the onset of menstruation. Finally, after about 3-4 years of menstruation, one follicle goes the whole way and produces a mature egg and it is this follicle that kick-starts the whole cycle of regular monthly ovulations/menstruation.

While a woman is born with about 2 million follicles, the overwhelming majority of these are never intended to mature. In fact, they die at an ever-increasing rate beginning from childhood. We don't know what mechanism determines which follicles die and which ones survive to go on to form eggs, but by the time a girl reaches puberty, the number of follicles has fallen from 2 million to about half a million. This process of attrition continues throughout a woman's reproductive life - each month 1 or 2 follicles are selected to mature, with several thousand more just withering away.

This process continues until the late 30s to early 40s when the total number of follicles has fallen to the point where the total amount of estrogen being produced by the ovaries starts to decline. Remember that these follicles are all producing estrogen whether or not they go on to mature into eggs - the ripening follicles are the richest source of estrogen, but all follicles are contributing. So by about the age of about 40, the critical mass of these follicles has fallen to the point where estrogen levels in the blood are discernibly falling. For most women, this gradual declining in estrogen production goes unnoticed although it often does manifest as increasing irregularities in the menstrual cycle.

Throughout the 40s, the progressive decline in the number of follicles and hence a progressive decline in estrogen levels in the blood begins to feed back upon itself. To start with, the brain responds to the falling estrogen levels by sending out urgent signals to the ovaries to develop more follicles. With time, these messages from the brain become increasingly more urgent in an attempt to keep the estrogen levels in the blood high. But the ovary can only respond as long as it has the follicles to develop, and with the ongoing attrition rate of follicles dying, the ovaries eventually run out of follicles.

Usually a woman stops ovulating about 3-5 years before she is truly menopausal. During this time, menstruation usually continues (although mostly it is irregular) because the ovary's production of estrogen and progesterone from the few thousand remaining follicles at this time (although they won't mature) is still sufficiently high to support the monthly growth and regression of the lining of the uterus. But finally the point is reached where there are just not enough follicles left to produce sufficient estrogen to maintain menstruation, and at that point, the woman has entered menopause. The uterus now moves from a monthly cycle of growth and regression to a stage of permanent inertia where it starts to shrink in size.

Ovarian activity after menopause

It is a common misconception that the end of ovulation means a total end to ovarian function and to estrogen production. The menopausal ovaries will continue to produce low levels of female and male sex hormones for many years, and of course the rest of the body continues to make estrogen in the fat.

Body fat is such an important source of estrogen in women that a number of studies have suggested that peri-menopausal women with more body fat tend to have higher estrogen levels in the blood compared to thinner women, and have menopause later, and make the transition through menopause with somewhat less discomfort.

Menopause is a 'human thing'

Literally, the word '*menopause*' means the 'end of menstruation'. Conceptually, it means a phase of life without reproductive capacity.

As far as we know, the woman is the only living thing on this planet that has such an extended period of infertility. Plants, insects and all other animal species essentially keep reproducing throughout life. Certainly other living things show decreasing reproductive performance as they move towards the end of their life - plants show lower flowering and fruiting performance, and animals show less frequent ovulations, lower birth weights, smaller litter sizes, lower milk production etc. But in essence all other animal species and forms of life retain the capacity to reproduce well into old age. Even men do. Just ask Charlie Chaplin.

This is a 'human thing' because the human is unique in having the longest nurturing time of any animal species. In stark contrast to all other animal species, human babies are born helpless and remain largely so for at least 4-5 years. The female young of most other species have already had at least one offspring themselves at an age when human female babies are just learning to run and to

feed themselves. Even if we compare ourselves to other relatively long-lived mammals such as apes, elephants and whales, the young of those species reach a degree of independence and an ability to survive at a considerably earlier age compared to humans. In every other animal species, the infant is expected at a comparatively young age to be sufficiently physically developed to not impede the capacity of the whole community to survive - to not disrupt the community's continual and vital search for food or its capacity to defend itself against predation.

During the early stages of evolution of the human species, we moved from being 'preyed upon' to becoming the major predator in the world, and from being a species that had to be constantly on the move for food to one which learnt how to exploit its environment through hunting tools, agriculture, food storage, cooking etc. All of these changes would have reduced the evolutionary pressure on the need to have early-developing infants. The need to nurture a baby for several years became no longer the life-threatening or socially disrupting burden that it would be for their pre-human ancestors.

The human infant is not physically, mentally or emotionally geared for complete independence until at least 10-12 years of age, the longest nurturing period in the animal kingdom. The menopause quite simply is nature's way of ensuring that the last child is fully nurtured through to independence. By making the age of about 50 as the cut-off point to have a baby, nature is ensuring that a woman would be able to complete the nurturing process of the last child by the time she enters old age.

The early change in human behaviour and social structure that reduced the evolutionary pressure on the infant for early development had a counter-effect on the woman - it would have increased the evolutionary pressure on the mother to ensure that she devoted her energies and resources to nurturing that child through to full independence. Continuing to have more babies in older life would have placed in jeopardy the survival of any later children. It is likely therefore that the gene pool of women who stopped being fertile early would have been preferentially preserved because the children of those women would have had a greater likelihood of survival.

The point being that menopause is a perfectly normal, desirable, planned and intended state. The only way that it was biologically feasible was to design a situation where steroidal estrogen levels declined sufficiently to no longer support reproduction. And the only way that this was possible without leaving an evolutionary misfit of a rapidly-deteriorating, estrogen-deficient body, was the presence of an auxiliary estrogen system.

Menopause is not a 'modern' phenomenon

A school of thought has arisen recently that says that menopause is a relatively modern phenomenon and that women were never designed to live long enough to reach menopause. The proponents of this theory point out that the modern woman is living well into menopause thanks only to improved living conditions and better nutrition and health care, and that the average woman in past generations never made it to menopause. So, they point out, given all of this, is it all that surprising women should develop adverse side effects of menopause such as hot flashes, osteoporosis and heart disease as a consequence of declining estrogen levels, because we are living past the point our ancient heritage intended?

This theory in its simplest form is saying that women were only intended to live until about 50 and that the modern lifestyle has created an artificial situation; by prolonging life past that point, we have now left women exposed unnaturally to low estrogen levels. This is a convenient theory, but it has a large number of holes.

First, there is the issue of whether or not women traditionally have lived to the age of menopause. The figures usually quoted showing that European women in the Middle Ages had an average life span of 40 or so years are exactly that - an average. That means some women lived less and some women lived longer. Almost certainly, throughout history, a certain proportion of women have lived long

enough to experience menopause. Aristotle (384-322 BC) wrote about the cessation of menstruation at age 40 years, suggesting that women lived long enough to experience menopause. The Old Testament in the Bible speaks of the age of humans as being 'three score and ten' - a figure which sits well with menopause at age 50 and another 10-12 years to complete nurturing of the last child. So menopause as a biological event is not 'new' - what is new is the fact that a greater proportion of women are now living to experience menopause than at any time in human history.

A more rational view to saying that women were never intended to live past 50 is the one that says that the capacity for longevity has always been there but circumstances (disease, poor nutrition etc.) conspired to prevent it happening for many women up until now. This is no different to the increasing average height of European communities. On average we are about 6" taller than our ancestors 400 years ago and our children will be about 1" or so taller on average than their grandparents. All of this is coming about largely because of better nutrition. That is not to say that humans were never intended to be tall. Almost certainly there have been tall individuals scattered throughout the ages. We simply are now providing an environment where the full biological potential can be realised. And that is all that is happening with menopause. The biological capacity and biological need for menopause has always been there - it is just that we are now providing an environment where that potential can be realized.

Women now are living longer than at any time in human history and more women are reaching menopause now than at any time in history. The average Western woman today can expect to live until her early eighties - that is, she will be menopausal for about 30 years. In just four centuries of Western civilization, we have taken the average length of menopause from no more than a few years to at least 30 years. The 'newness' of the menopause lies only in the modern opportunity to live longer. The fundamental reasons for menopause are as old as time itself.

The modern view of menopause

As remarkable as it may seem, here at the beginning of the 21st century we are still struggling to understand the menopause and just what it means biologically to a woman. One of the great barriers to fully appreciating this important stage of a woman's life has been an historical tendency in European culture to regard the female experience in negative terms.

From ancient times through to the middle-ages, menstruation generally was regarded in European societies as a 'cleansing process' that removed obnoxious substances from a woman's body. Writing in 1746, the Frenchman, La Motte, noted "menstrual blood kills bees by its vapours, makes dogs mad if they taste it and destroys any plant that comes near it". If you believed this, then it wasn't much of a stretch to see menopause as meaning that all sorts of 'impurities' and 'toxins' and 'noxious vapours' would remain trapped within the older body. This explained all manner of ill-health following menopause and led to a belief that blood-letting or the use of toxic herbs in an effort to induce menstruation would relieve ill-health in menopausal women and restore a youthful state.

Some would argue that we haven't travelled all that far from that medieval view. We might have a better understanding of the biological processes that lead to menopause, but that we still regard menopause negatively in using such terms as 'an estrogen deficiency state' to describe what is a perfectly normal stage of a woman's life. This has led to a belief in mainstream Western medicine that most women over the age of about 55 need replacement female sex hormones if they are to ward off the ravages of low sex hormone production.

The concept that most women need synthetic hormones in the second half of their life just to maintain a healthy body is bizarre to say the least, and despite the best efforts of vested interests such as makers of these synthetic hormones to convince us of this need, women by and large are rejecting this notion. Women instinctively realize that menopause is not a *disease* - it is a natural life-cycle event that is

meant to be and one that carries certain biological and social benefits. It also should be a stage of life that can be enjoyed without the crutch of pharmaceutical preparations.

And yet the menopause does bring problems. Women are trying to reconcile their instinct for menopause being a 'natural' stage of life, with the reality that they turn 50 and have their life seriously disrupted for 2 years by hot flushes and emotional disorders and disturbed sleep pattern; that they can emerge from those problems only to find at the relatively young age of 55 that they are incontinent or have a vagina that is thin and dry to the point that they no longer want to have sex; and that in their sixties when they are still physically active they are being limited by high blood pressure and a high risk of bone fractures; and that at the age of 75 when they should be enjoying grandchildren and their families they are rapidly losing mental capacity.

Trying to come to terms with the rationale behind the menopause is of more than academic or philosophical interest. If it is, as some people hold, a modern phenomenon that Eve was never designed for or intended to undergo for more than a few years, then this is an unintended problem and therefore providing synthetic hormone support probably makes sense. But if it is intended, then it makes no sense from a biological and evolutionary perspective to believe that we need drugs to support our bodies for the second half of our lives, and if we shouldn't need drugs, then why have we reached the point where we apparently need them?

This is akin to asking whether the human body was ever meant to live long because Type 2 diabetes is so prevalent in the older community. Type 2 diabetes is overwhelmingly a lifestyle issue - the result of eating more than we need and falling into a sedentary lifestyle. Saying that menopause represents an unintended failure of the estrogen system makes no more sense than saying that Type 2 diabetes represents failure of the insulin system because we weren't meant to live as long as we are. In managing Type 2 diabetes, doctors generally advise patients to modify their lifestyle factors in the first instance, and for most people this provide perfectly adequate management of the condition. For those where there continues to be deterioration, drugs will be necessary. It seems reasonable to suggest that menopause should be approached in the same way.

Symptoms of menopause

The main outcome of menopause is to allow the reproductive organs to regress. For nearly all women this occurs in an orderly and unremarkable fashion. What isn't so orderly and unremarkable is the impact that this has on the rest of the body. The invigorating and nourishing effect that estrogen has throughout the body on the non-reproductive tissues is now being withdrawn.

It is not difficult to see how

the brain, having been bathed in a hormone (estrogen) that has contributed to mental capacities such as awareness, happiness and mood, would be the worse for having it withdrawn

muscles, where estrogen contributes to strength and stamina, would respond by becoming weaker and more prone to tiredness

ligaments and tendons, where estrogen contributes to their suppleness and strength, would respond by stiffening

skin, where estrogen makes a significant contribution to thickness and suppleness, would respond by becoming thinner and drier

arteries, where estrogen makes a major contribution to their ability to relax and to remain healthy, would respond by hardening and becoming more susceptible to atherosclerosis

bones, where estrogen has a major influence on maintaining bone strength, would respond by becoming weaker and more prone to fracture.

For most women, the tell tale symptom of menopause is the hot flush, that mysterious symptom that causes them to sweat to the point of saturating their dress or nightwear, or leads them to throw off clothes in the middle of a winter snow storm. As startling as this symptom can be, for most women it is a temporary inconvenience that usually settles down after 6 months or so. What is more serious is a range of other problems that represent deterioration of a wide range of body parts that tend to get overlooked before they are far more insidious and less obvious than hot flashes. It is these other problems that constitute the bulk of menopausal symptoms and which are the serious consequences of menopause.

Five sobering menopausal statistics

In Western countries:

- 75% women entering menopause experience acute menopausal symptoms of hot flushes/night sweats
- 50% women over the age of 60 experience weak bones and about half of these will progress onto osteoporosis and suffer a major bone fracture
- 80% women over the age of 60 experience cardiovascular disease
- 20% women over the age of 60 experience senile dementia/Alzheimer's disease
- 15% women over the age of 60 develop cataracts.

When menopausal symptoms kick in

Different tissues have different dependencies on estrogen, and so the time that it takes for any of these tissues to start malfunctioning will vary from tissue to tissue. As a general rule-of-thumb, the malfunctions can be divided into three categories depending on the time they start in relation to the start of menopause.

1. Acute symptoms.

These generally start before the periods have stopped. The acute symptoms usually are limited to the months and years immediately before and immediately following the onset of menopause and normally settle down once a woman is fully menopausal. These symptoms are the result of a rapid drop in estrogen levels, more so than simply low estrogen levels.

Hot flushes

Night sweats

Insomnia

Mood changes

Anxiety, irritability

Poor memory/concentration

2. Medium-term symptoms.

These generally start once a woman has entered menopause, and then can get steadily worse with time. These are the body's initial response to constant, low estrogen levels.

Reduced muscle tone

Vaginal atrophy

Incontinence

Loss of libido

Bladder prolapse

3. Chronic (or 'long-term') symptoms.

These start many years after a woman has entered menopause and also get worse with time. These represent a delayed response of the body to long-term low estrogen levels.

Coronary heart disease

Osteoporosis

Cataracts

Senile dementia/Alzheimer's disease

ACUTE MENOPAUSAL SYMPTOMS

About 75% of Western women report experiencing these symptoms about the time of menopause. For most women these symptoms are temporary, lasting from a few months up to about 3 years. In a small number of women, the symptoms will persist for as much as 10 years, or even in some rare cases for the rest of their lives.

Short-term menopausal symptoms are essentially a classic drug withdrawal effect. There is no doubt that estrogen is a great hormone - it is a 'feel good' hormone. When a woman has adequate amounts of estrogen, everything is humming along nicely. All her systems and tissues have plenty of estrogen to keep them running optimally. The brain in particular enjoys estrogen stimulation, producing a 'feel good' sensation. Then quite suddenly, the supply of this 'feel good' drug dries up. Having become

addicted to this hormone for the past 25-30 years, the brain quite understandably isn't going to take this withdrawal lightly.

The acute symptoms that women entering menopause experience are the same as seen in younger women shortly after giving birth. The removal of the placenta with its strong estrogen-producing capacity robs a woman of her source of estrogen, causing her estrogen levels to drop dramatically following childbirth. This rapid withdrawal of estrogen means that many women experience symptoms such as hot flashes and mood swings and depression in the weeks and months immediately following birthing. The so-called 'baby blues' are in essence no different to the depression experienced by women entering menopause as a result of falling estrogen levels.

It also is interesting to note that it also is easy to produce symptoms of acute menopause in men. This happens in men being treated with HRT for one of two purposes - either for the treatment of prostatic disease or as part of a sex-change process. In either case, once the treatment ends and the HRT is withdrawn, many of these men experience hot flashing, sweating and mood changes in exactly the same manner as menopausal women. All that has happened in these men is that their brains have become 'addicted' to estrogen and those symptoms are nothing more than a reflection of withdrawal from that addiction.

The short-term menopausal symptoms normally get better with time. Our brain eventually adjusts to the fact that it is going to have to do without high estrogen levels, and like recovery from any addiction, equilibrium ultimately is restored. Just how long that equilibrium takes to come varies enormously between women. Usually the symptoms start to decline after about 6 months and have gone almost totally by 1-2 years. At the extremes of this spectrum, about 25% of women report no symptoms at all, sailing through the menopause without any apparent symptoms, while about 5% find themselves still suffering symptoms after 10 years.

(a) Hot flash (or flush).

This is the most commonly reported acute menopausal symptom. The exact cause of the hot flash hasn't been determined although it appears to be due to an error in the body's heat-regulating mechanism. It is thought that the sudden fall in estrogen levels in the blood somehow fools the heat-regulating control centre in the brain into mistakenly believing that the body is over-heating. That causes the brain to initiate responses such as pooling of blood in the skin and sweating as a means of dispensing the excess heat. The hot flash appears as a sensation of heat usually accompanied by reddening of the skin. It can appear on any part of the body, but frequently is around the head and neck. In some cases it leads onto profuse perspiration. The irony is that the effect of losing all of this body heat through the skin is to cause the core body temperature to fall, leading to shivering. So while the brain thinks that the body is over-heating, it actually is under-heating.

There is no set pattern to hot flashes. They can last for as little as several minutes or as much as an hour; they can occur as little as once a month or as much as 30 times a day. And they can occur at any time during the day and night.

One of the main practical effects of hot flashes is their inconvenience and embarrassment. They are entirely unpredictable and can strike at any time - during business meetings, at the shopping mall, on the golf course, and during intimate moments.

(b) Night sweats

A night sweat is simply a hot flush at night. In many women who are having hot flushes both day and night, the night-time ones for unknown reasons often can be much worse. Many women wake up in the middle of the night wringing wet, with their nightwear and bed-sheets literally soaked with

perspiration. This can happen several times each night and the effect on their sleep pattern (and that of their partner) can be considerable.

(c) **Insomnia**

Most cases of insomnia probably are due to night sweats. There is just no way known that anyone will sleep through a sweating episode at night that involves saturating a nightie and sheets. But even so, some doctors and women believe that insomnia is a separate symptom and that a woman's sleep pattern changes for the worse during the peri-menopause time even in the absence of night sweats.

(d) **Emotional effects**

Given the important influence of estrogen on brain function, particularly its 'feel good' effects, it is hardly surprising that its sudden withdrawal would have a significant effect on our emotions and sense of well-being. Symptoms often reported as part of acute menopause include

sudden mood swings - unpredictable behaviour swinging from a happy disposition one minute to snappiness the next

irritability - easily upset by small, trivial things

anxiety - small problems that a woman would normally take in her stride now become major issues of concern

depression - can go days on end when it feels as though the world is crushing in

sudden weeping - can just start crying for no apparent reason

general tiredness - experience a complete loss of energy and 'get up and go'.

To some extent these symptoms are influenced by hot flashes. The embarrassment and disruption to life that hot flashes can cause, plus the lack of sleep that can come with night sweats, are all going to put pressure on a woman's sense of wellbeing. No-one is going to feel full of energy and cheerful when they have woken up wringing wet 5 times a night for the last 2 months. But leaving aside that effect, there is little doubt that falling estrogen levels have their own, independent effect on brain function. Some women experience a severe emotional roller-coaster ride without serious hot flashes or sleeplessness, and the effect of this on their quality of life and that of their partner, family and workmates can be significant.

MEDIUM-TERM MENOPAUSAL SYMPTOMS

The significance of these symptoms is that they mostly are 'quality of life' symptoms. As inconvenient as hot flashes and mood swings are, they generally can be tolerated because for most women they have a finite term. You know that they are going to come to an end. But the medium-term symptoms generally have no end in sight, and generally represent permanent loss of function.

(a) **Reduced muscle tone**

Muscles generally are estrogen-responsive. The male sex hormone, testosterone, plays a role in building muscle mass, but estrogen seems to play a role in maintaining muscle tone. The main outcome of low estrogen levels therefore is a general feeling of tiredness and weakness, but there are some specific problems –

- when the sphincter muscle surrounding the neck of the bladder loses tone, this leads to reduced control over urine release (leading to urinary incontinence)
- when the muscles lining the pelvic wall lose tone, the bladder and uterus are less restrained and become prone to prolapse
- when the muscles in the wall of the vagina lose tone, the vagina becomes floppy and this can lead to reduced sexual satisfaction.

(b) Vaginal atrophy

Atrophy is a term meaning ‘thinning and shrinking’ of tissues. Low estrogen levels cause the wall and lining of the vagina to become thinner. The glands in the lining of the vagina that normally produce mucus to keep the vagina well lubricated, particularly during intercourse, also atrophy. The result of all of these changes is a thinner, drier vagina that can lead to painful intercourse and that makes the vagina more prone to infection.

As regrettable as this change can be, it is stretching a point to refer to it as a ‘symptom’. This change goes to the very heart of the purpose of menopause, which is to relieve the older woman of the burden of childbearing. The withdrawal of estrogen after menopause shuts off the driving force for the maintenance of the female reproductive system. The uterus shrinks and ultimately collapses into a small pocket of tissue about the size of a golf-ball. The breasts lose their glandular tissue, leaving just fat tissue - as a result, they lose size and firmness. These are normal atrophic events and apart from the cosmetic appearance of the breasts in menopause that may concern some women, atrophy of the breast and uterus carries the very big advantage of reducing a woman’s risk of disease of these tissues.

The vagina is an integral part of the female reproductive system and it also gets caught up in the general shrinking of the reproductive system after menopause. Vaginal atrophy really is no more a ‘symptom’ than loss of breast structure following menopause. Nevertheless, it is a *change* that can be a problem for many women in a relationship.

(c) Skin effects

Skin is affected by estrogen in two main ways. The first way relates to the effect of estrogen on the body’s water balance. Estrogen promotes water-retention in the skin, resulting in thicker more lustrous skin and hair. The second way relates to the fact that estrogen helps keep the collagen tight in skin by cross-linking individual collagen fibres.

Low estrogen levels therefore lead inevitably to thinner, drier skin and hair. As the collagen also relaxes because of less cross-linking, it allows the skin to stretch and to form wrinkles.

As with atrophy of the breast and vagina, it is stretching a point to call this adverse cosmetic effect of menopause on skin a symptom, although obviously it can represent an important lifestyle concern to many women.

A menopausal skin effect that probably does qualify as a ‘symptom’ is the growth of new facial hair. Hair growth is mainly a male sex hormone effect, and in younger women this effect is effectively counter-balanced by the natural opposing actions of male and female sex hormones. But in menopausal women, the menopausal ovaries can maintain their output of testosterone at the same time that they are decreasing their estrogen output; once the testosterone has a free reign, it can lead to increased hair production. While the cosmetic effects of this may bother some women, the counterbalance could be that this extra testosterone charge is probably giving their libido a boost.

CHRONIC MENOPAUSAL SYMPTOMS

These symptoms relate to the overall nourishing effect of estrogen on the non-reproductive tissues of the body, but particularly on the heart, arteries, bone and brain. These tissues are not acutely dependent upon estrogen in the sense that sudden withdrawal of estrogen is going to cause immediate dysfunction. But the beneficial effects of estrogen, while subtle, nevertheless are so essential to normal functioning that deterioration in all these tissues starts to set in within several years of menopause for most Western women.

As a group, these symptoms have major implications for the long-term health of women. The impact of these symptoms is far more than the 'quality of life' impact of the acute and medium-term symptoms. The long-term symptoms can be debilitating and life-threatening.

(a) Cardiovascular effects

The detrimental effects of low estrogen levels on the health of the heart and arteries arguably are having the most serious health implications of the menopause. The most common cause of death in women over the age of 50 is coronary artery disease, killing more women than all the types of cancer combined.

As we saw earlier, the benefit of estrogen to cardiovascular health can be summarized thus:

- estrogen helps protect the lining of the arteries from becoming damaged from cholesterol by encouraging the liver to make 'good' HDL cholesterol
- estrogen helps relax arteries and thereby help reduce blood pressure.

With all these benefits of estrogen to our cardiovascular system, it stands to reason that a woman's risk of heart disease will rise after menopause. In fact, menopause is the single most important risk factor for heart disease in older women. But we need to keep this in perspective. It is important to understand that we are talking here of a relative risk. Low estrogen function simply is going to put the menopausal woman at an increased risk of cardiovascular disease - it is not a death sentence. Menopause with its lower estrogen function is creating an environment where the cardiovascular system is more prone to disease if other adverse factors intercede. And those other adverse factors are a poor diet, genetic factors (if one or both of your parents developed heart disease at an early age), hypertension, smoking and obesity. It is the combination of any one of these other risk factors on top of a low estrogen level that tips a woman over the edge into cardiovascular disease.

The two main outcomes of lower estrogen on the cardiovascular system are higher blood pressure and atherosclerosis. Both conditions increase the risk of heart attack and stroke.

Atherosclerosis is a disease where cholesterol builds up in the wall of our arteries, acting as an irritant and causing the artery wall to become inflamed and thickened. The result is a dramatic thickening of the artery wall with a resulting narrower artery for blood to flow through. This can happen to arteries anywhere in the body, but it commonly happens to the arteries supplying the heart muscle. Blockage of these arteries causes heart failure. When the arteries involved are the ones supplying blood to the brain (carotid artery), blockage can result in stroke.

(b) Osteoporosis

One of the most important effects of estrogen on the non-reproductive parts of the body is to promote bone health, which it does by maintaining a healthy balance between the rate of bone building and the rate of bone destruction. In the absence of estrogen, bone building slows down and the balance then shifts towards bone loss. With bone being dissolved by the bone-destroying cells faster than it can be replaced by the bone-building cells, the bone gradually becomes more porous. After 5-10 years of this insidious process, bones reach a point of weakness that makes them prone to collapse and fracture.

This loss of bone density starts in a woman from about her mid-40s. It is a common misconception that bone loss doesn't start until after a woman enters menopause, whereas in reality, the problem starts at a time when most women are not even thinking that they may be heading for any trouble. In fact, the rate of bone loss (that is, how much bone density is being lost each day) is greatest between the ages of 45-55, when the rate tends to slow and then become constant thereafter.

The entire skeleton is affected by this process, but there is a difference in those bones most likely to succumb to fractures.

The **bones in the spine (vertebrae)** are most frequently affected after menopause. As these bones soften with age, they become progressively squashed by the weight of the upper torso. The outcome of this is that women and men get shorter as they get older. Women in particular seem more prone than men to this effect, with the collapse of the vertebrae in the shoulder region leading to the curvature problem known as 'dowager's hump' that affects many older women.

The **wrist and ribs** are the next bones most liable to fracture, simply because these are the bones that are most likely to take the brunt of pressure when we bump into objects or when we fall over.

The **hip joint** is potentially the most serious of all the bones that we can fracture, since these fractures require corrective surgery and invariably leave the patient with restricted movement for the rest of her life. A hip fracture also is a traumatic event, with 1 in 5 women suffering a hip fracture dying within 1 year of the event.

The statistics for Western women are:

- 1 in 3 women over the age of 50 will develop osteoporosis
- 30-50% of women over 50 will suffer a vertebral fracture
- 1 in 5 women will suffer a hip fracture.

The problems resulting from osteoporosis have become of major significance in community health. Fractures now account for a significant number of hospital admissions and nursing home beds in Western countries. In the US alone, it is estimated that close to 2 million fractures per year are attributable to this disease.

(c) Brain function

We've already canvassed the importance of estrogen to brain function, particularly emotional wellbeing and cognitive function (the ability to learn and to remember and to identify).

Ageing is associated with reduced brain function in both men and women. The brain is no different to any other tissue and will naturally slow down with advancing age. The so-called cognitive functions such as short-term memory typically are among the functions most affected by this aging process.

This normal age-related deterioration of brain function only becomes a 'disease' when it becomes severe and is recognized as the senile dementia-Alzheimer's syndrome. The influence of estrogen on this syndrome is unclear, but we know that women are about three times more prone to this syndrome

than are men, and the incidence of the syndrome rises after menopause, so the implication is there that low estrogen levels are involved in some way.

Precisely how a low estrogen level is affecting brain function is not clear. It could be a direct effect, with low estrogen levels leading to lower endorphin levels in the brain. Or it could be an indirect effect, with low estrogen levels reducing the rate of blood flow to the brain as the arteries feeding the brain become harder and narrower.

(d) Cataracts

A cataract is crystallization of the lens of the eye. The early stage of this disease produces cloudy vision, but the advanced stage leads to blindness. Recent studies suggest that this crystallization process is an estrogen-sensitive mechanism and that falling blood estrogen levels predispose to cataract formation. So it can legitimately be regarded as a symptom of menopause.