

# Hormones and Me

## Puberty and its problems



Australasian Paediatric Endocrine Group



Hormones and Me

# Puberty and its problems



## Table of Contents

About this Book	2
Introduction	3
Hormones	4
Hormones Affecting Puberty	5
Normal Puberty	7
Common Variations of Pubertal Development	9
True Early (Precocious) Puberty	15
Other Rare Causes of Early Puberty	17
Treatment of Early Puberty	18
Social Concerns Relating to Early Puberty	20
Questions and Answers	23
Glossary	26
Support organisations and further reading	30
References for text	31
Hormones and Me booklet series	32

## About this Book

This booklet, *Puberty and its Problems*, aims to give you a basic understanding of the course of puberty and development, and the problems that may occur in some individuals.

We encourage you to discuss any additional questions or areas of concern with your doctor after reading this booklet.

Merck Serono Australia is proud to bring you this booklet from the *Hormones and Me* educational series. We hope that you find it a valuable and helpful resource.

This booklet was revised in 2011 with the help of Prof Jenny Batch (Royal Children's Hospital, QLD, Australia) – a Paediatric Endocrinologist specialising in childhood endocrine disorders and a member of the Australasian Paediatric Endocrinology Group (APEG), and Dr Dianne Jensen (Royal Children's Hospital, QLD, Australia) – Research Fellow in Endocrinology.

Paediatric endocrinologists, A/Prof Margaret Zacharin (Royal Children's Hospital, VIC, Australia) and Dr Ann Maguire (The Children's Hospital at Westmead, NSW Australia) have reviewed the *Hormones and Me* series on behalf of the Australasian Paediatric Endocrine Group (APEG).

This booklet was first updated and reproduced for Australian and New Zealand readers in 2000 by Prof Jenny Batch. Special thanks to the original authors and editors, Dr Richard Stanhope (Great Ormond Street Hospital for Children and the Middlesex Hospital, UK), Mrs. Vreli Fry (Child Growth Foundation, UK), Ms Sandra Ramsden (The Middlesex Hospital UK) and the British Society of Paediatric Endocrinology (BSPE).



## Introduction

Puberty is a time of great transformation for any adolescent, even when it follows a 'normal' course. There are changes to almost all aspects of a young person's life; academic demands increase, social relationships become more complex, independence to some may seem daunting and the physical changes of puberty can be frightening.

When puberty comes early or late, this can cause further difficulties. Family and friends need to be supportive of the young person as he or she comes to terms with 'being different' from peers.

This booklet has been written to help you understand more about 'normal' puberty as well as its variants, particularly precocious (early) puberty.

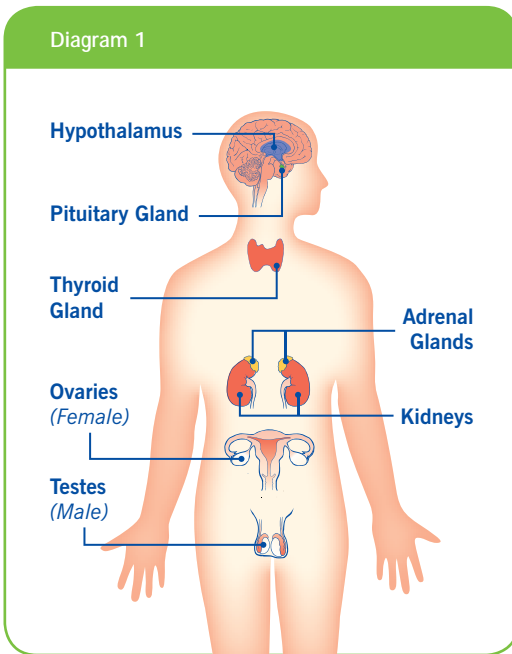
## Hormones

Hormones are chemicals which are carried throughout the body by the blood. The body makes many hormones (e.g. thyroid, growth, sex and adrenal) that work together to maintain normal body functions.

### The Control of Hormone Secretion

The hypothalamus is located in the brain above the pituitary gland and regulates the release of hormones from the pituitary gland. The pituitary gland, which is often referred to as the 'master gland', regulates the release of most of the body's hormones (chemical messengers that send information

to different parts of the body). It is a pea-sized gland that is located underneath the brain. The pituitary gland secretes many hormones, e.g. growth hormone and hormones to control the function of the thyroid and adrenal glands and the gonads (ovaries and testes) (see Diagram 1).



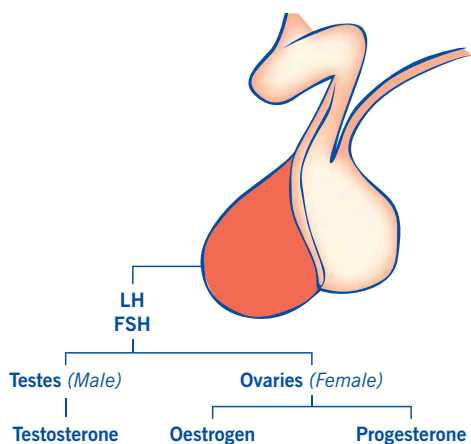
## Hormones Affecting Puberty

There are a number of hormones, which directly affect the course of puberty.

### Gonadotrophin Releasing Hormone (GnRH)

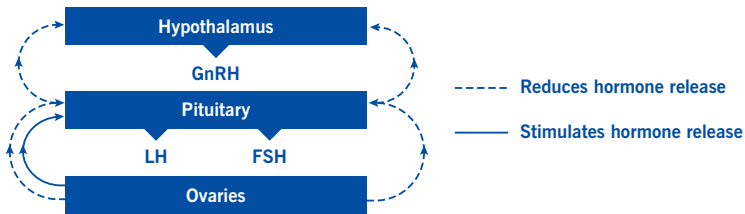
This hormone is released by the hypothalamus and controls the release of luteinising hormone (LH) and follicle stimulating hormone (FSH) from the anterior pituitary gland. The release of this hypothalamic hormone is the most important control mechanism regulating pubertal development and fertility. Both LH and FSH act on the ovaries in girls or testes in boys, to initiate the release of oestrogen and testosterone. Oestrogen and testosterone are often referred to as sex hormones and they are responsible for the development of pubertal characteristics as well as changes in behaviour (see *Diagrams 2 and 3*).

Diagram 2



# Puberty and its Problems

Diagram 3



## Gonadotrophins

### Follicle Stimulating Hormone (FSH)

This hormone is released by the anterior lobe of the pituitary gland. It stimulates the ovaries and testes to produce eggs and sperm respectively.

### Luteinising Hormone (LH)

This hormone is also released by the anterior lobe of the pituitary gland. It stimulates the release of female and male sex hormones from the ovaries and testes.

### Oestrogen

A female sex hormone, which is secreted by the ovaries. It is responsible for breast development in girls.

### Testosterone

A male sex hormone (an androgen) which is secreted by the testes in boys and men. It is also present in much smaller amounts in women. Other milder androgens from the adrenal glands (located near the kidneys) stimulate pubic and axillary hair growth at the time of puberty in both boys and girls.





## Normal Puberty

The early changes of puberty usually occur between the ages of 10-13 years. They are noticeable in girls by the budding of breasts and then pubic hair, with menstrual periods starting between 11–14 years of age. Boys usually develop testicular enlargement and then pubic hair (9–14 years). Underarm and facial hair and deepening of the voice occur typically between 13-16 years.

“The difference between the average age of onset of puberty between girls and boys is only 6 months, although it is often thought to be several years!”

In girls, the growth spurt occurs early in puberty and commences at the same time as the onset of breast development, with growth slowing down after the onset of the first period. In contrast, boys have a growth spurt which occurs later, commencing halfway through puberty. The difference between the average age of onset of puberty between girls and boys is only 6 months, although it is often thought to be several years! This is probably because the early events of puberty in boys are hidden whereas breast development in girls is much more socially obvious. In addition, the later growth spurt in boys only maintains this common misconception. The growth spurt of puberty depends on both growth hormone and sex hormone secretion. Deficiency of either hormone leads to a reduced growth spurt.

A baby is born with high levels of gonadotrophins which often last up to 6 months after birth. Sometimes, testosterone levels in baby boys can be half the level of an adult man. Usually FSH, LH and testosterone levels are very low by 1 month of age and remain low until they begin to gradually increase again at 7–8 years of age.

# Puberty and its Problems

The hormonal changes at puberty starts very gradually and it is only when the level of sex hormones reaches a threshold that the development of sexual characteristics is stimulated and puberty is described as having commenced. However, the hormonal events of puberty have usually started several years prior to the onset of the appearance of secondary sexual characteristics.

It is when these changes begin earlier than 8 years in a girl and 9 years in a boy that an assessment needs to be made, by a specialist, to determine what the cause of the early pubertal development is.



# Common Variations of Pubertal Development

## Early Normal Puberty

In many countries including Australia, children appear to be going through puberty at an age which is much younger than children in previous generations. This is called the secular trend in growth and development. The earlier age of puberty is probably due to the effects of improved nutrition and living circumstances and absence of chronic disease. This seems to be particularly true for girls, with many girls showing early signs of breast development just before 8 years of age. This means some girls will start to have menstrual periods while still in primary school. In most cases this early puberty is just a variation of normal. After assessment by a specialist, no specific treatment is usually required. The girl and her family need to have the situation explained, and if needed a child psychologist can help both the child and family. Enlisting the help of the teacher is also very helpful.

## Delayed Puberty

Delayed puberty is defined as lack of any pubertal development by 13 years of age for girls and 14 years for boys.

Delayed puberty is generally more of a clinical problem in boys than girls and certainly causes more problems with behaviour and self-esteem in boys than girls. Boys may be teased about lack of development or left out of sporting teams. They may feel left out of attention from the opposite sex. Girls with delayed puberty may feel different and left out of discussions about periods, clothes and other topics of conversation in their peer group. These concerns may seem trivial but on occasions may lead to significant behavioural problems, including truanting. Boys with delayed puberty may bear the brunt of cruel verbal and physical teasing and bullying. The distress of

# Puberty and its Problems

adolescents with delayed puberty may result in significant behavioural and emotional disturbance.

“Delayed puberty is defined as lack of any pubertal development by 13 years of age for girls and 14 years for boys”.

Most often, delayed puberty is due either to a familial delay or as a result of a chronic disease. If a hormone deficiency or chronic disease is causing the delayed puberty, then this underlying cause should be treated appropriately. Psychological and emotional factors are important, particularly in 14 or 15 year old boys. It may be necessary to refer for assessment and consideration of treatment with the appropriate sex hormone. In boys this may be in the form of an injectable testosterone preparation such as testosterone esters (Sustanon) or testosterone enanthate (Primosteston Depot) for a short course; an alternative would be an oral androgen, such as testosterone undecanoate (Andriol). In girls, oral oestrogen or transdermal oestrogen (using skin patches or gel) can be used. Girls seek medical advice for delayed puberty far less often than boys. Therefore, such treatments are used in boys more often than girls.

If used inappropriately, sex hormone treatments can adversely advance bone age and thus stunt final height outcome. Therefore referral to a paediatrician or endocrinologist is essential.



## Premature Thelarche

This is a self-limiting condition consisting of unilateral (one) or bilateral (both) breast development. It occurs usually in girls under 3 years of age and may continue from the breast development in the first few months of life which results from oestrogen in the mother's milk. There are no other signs of oestrogen effects and growth is normal. However, increase and decrease of breast size at monthly to six weekly intervals is common in this condition. This does not affect the timing of the other signs of normal puberty. Premature thelarche may result from the occasional formation of ovarian cysts and/or increased sensitivity of the breast tissue to oestrogen stimulation from apparently normal levels of oestrogen within the body. The importance of the correct diagnosis of premature thelarche is to distinguish this condition from precocious puberty. No treatment is necessary. Usually the condition ceases within a year or two with disappearance of the breast tissue. Growth and final height are unaffected. Puberty occurs at the normal time and fertility is thought to be normal. The condition is probably common, as many mild cases may never be presented to a specialist.

## Premature Adrenarche

This is a self-limiting condition of pubic hair development, usually occurring between the ages of 6–9 years in both boys and girls. The pubic hair will remain until the rest of pubertal development (i.e. genital development in boys and breast development in girls), occurs later at an appropriate age. There may be an increase in the rate of growth along with a slight advancement of bone age. This is a normal pattern of adrenal development which requires no treatment. Occasionally this condition may be due to an underlying abnormality in the adrenal glands, but this is rare and the effects on a child are usually much more

# Puberty and its Problems


marked than in simple premature adrenarche. Occasionally, premature adrenarche can be associated with a later onset of polycystic ovary syndrome (PCOS) in teenage girls.

## Isolated Premature Menarche

At the beginning of normal female puberty, the small amounts of oestrogen made by the ovary switch 'on and off'. If enough lining of the womb is made with each 'switch on', there may be a small vaginal bleed when the 'switch off' occurs. This may happen several months in a row, and then disappear as total oestrogen increases and normal puberty progresses. It is a normal variant and usually needs no treatment. Before the diagnosis of premature menarche is accepted, all other causes of premature oestrogen secretion, and/or any local causes of vaginal bleeding, must be eliminated by the specialist.

## Pubertal Gynaecomastia

Palpable or visible enlargement of glandular breast tissue is found in 40–50% of normal adolescent males. In most patients with gynaecomastia, no underlying pathological cause is present; therefore, pubertal gynaecomastia needs to be considered as a normal variant of pubertal development. Pathological causes include Klinefelter Syndrome in which the testes are significantly smaller than in normal adolescent males. Other uncommon causes include partial androgen insensitivity. Lavender oil and tea tree oil, when used in skin-care products, have been associated with gynaecomastia. Drugs (such as digoxin, spironolactone, cimetidine, chlorpromazine and marijuana) may be associated with gynaecomastia. Soy products contain phytoestrogens and if consumed in large amounts can also cause gynaecomastia.



There is no hormonal or medical treatment for pubertal gynaecomastia. Administration of testosterone, either orally or intramuscularly, is ineffective. It may even worsen the problem because a small amount of administered testosterone is changed in body fat to oestrogens, thus aggravating the breast tissue development. Most boys with gynaecomastia can be given assurance that the condition will subside and nothing needs to be done. Most cases will resolve within two or three years. Advice regarding clothes (such as wearing baggy T-shirts for social activities including swimming) and sending appropriate letters to schools may be useful.

If gynaecomastia is marked or causing extreme psychological and emotional distress, referral to a reconstructive surgeon for a subareolar mastectomy (operation to remove breast tissue) is well justified.

Some doctors treating adult men for gynacomastia have used selective oestrogen receptor modulators (SERMs), drugs more commonly used for women who have had breast cancer. SERMs are not approved for use in adolescents and probably prevent proper bone mass accumulation. They are therefore contra-indicated in this age group.

The management of fatty breast development in males is more difficult than true gynaecomastia. There may be a degree of true gynaecomastia in association with the fat deposits. The fat deposits are certainly likely to persist or recur following surgery and the result overall is less satisfactory.

In contrast to boys with pubertal breast development, gynaecomastia can be prevented in boys with Klinefelter Syndrome by the appropriate use of a subcutaneous or other long-acting testosterone replacement at puberty.

# Puberty and its Problems

## Asymmetrical Breast Development

Asymmetrical breast development can occur in both males and females. In males, it is a variant of pubertal gynaecomastia. In females, breast development may be asymmetrical at the beginning of breast budding or subsequently through breast development.

The degree of asymmetry can be quite marked. Consideration should be given to the possibility of an underlying chest wall or muscle abnormality and examination should be conducted appropriately. However, in most cases asymmetrical breast development is just a physiological variant of puberty.

In rare cases, an underlying vascular (blood vessel) abnormality or lipoma (benign fatty tumour) may cause one breast to appear larger than the other. This can usually be readily determined by a physical examination and confirmed by ultrasound.

**“Most girls cope with the situation by wearing loose-fitting garments and T-shirts over swimwear.”**

Reassurance and monitoring are all that are usually required. For self-esteem and cosmetic reasons, advice should be given to teenage girls about temporary use of padded bras or “chicken fillets”, a form of gel filled sac that fits inside a standard bra. These are easily purchased from any lingerie shop. Most girls cope with the situation by wearing loose-fitting garments and T-shirts over swimwear. In most situations, the asymmetry resolves with full pubertal development. On rare occasions, however, referral to a reconstructive surgeon for breast reduction or augmentation may need to be considered. Referral should not be made until breast growth has completely stabilised and is considered complete.





## True Early (Precocious) Puberty

Precocious puberty means that the physical signs of puberty, i.e. breast development in girls, genital enlargement in boys, and the appearance of pubic hair, occur at an earlier age than usual. In true precocious puberty the appearances of sexual development are identical to normal puberty, it is just that they occur earlier. The child may be taller than other children in the class and more solid in his or her build. The increase in height is due to a premature pubertal growth spurts and the bone age will be advanced. An X-ray of the left hand and wrist will determine this. It will indicate how much time remains for growth and allows an approximate prediction of final adult height. Although the child may be tall now, if the problem is not treated he/she may end up shorter than expected because of premature fusion of the long bones i.e. reduced time to the end of the growing period. This is a very important consideration when deciding whether treatment is required. Should the specialist decide that the child would benefit from treatment it would be to stop or reverse puberty, i.e. breasts, pubic hair, periods etc, and hopefully preserve growing potential in the bones.

**“In true precocious puberty the appearances of sexual development are identical to normal puberty, it is just that they occur earlier.”**

As well as growth, there are two other reasons to treat precocious puberty. It is important to stop or reverse the signs of puberty as the individual child may be extremely distressed that he/she is different from their peer group. There are numerous psychological reasons why therapeutic help should be offered. Going through puberty may be difficult enough when it occurs during the usual age range. For a younger child, puberty and the associated physical changes may cause great emotional distress.

# Puberty and its Problems

Puberty that commences too early (and the same applies if puberty is very late) can be associated with behavioural problems in both girls and boys. In some cases this may result in masturbation at socially inappropriate times particularly in children who are very young or also have intellectual disabilities. Concentration in school and social integration may also be affected in early puberty.

The reason early puberty occurs is that the hypothalamus or pituitary gland signals the ovaries or testes to make female or male hormones at an earlier than usual time. In the majority of cases the cause of this is unknown. The condition may be caused by cysts or tumours at the base of the brain, however, this is very rare. It may be that the child's specialist advises that some special X-rays or scans of the brain be taken in order to investigate this possibility. Brain cysts and tumours causing true precocious puberty are much more common in boys than girls and brain scans are always required in boys. True precocious puberty is about twenty times more common in girls than in boys.



## Other Rare Causes of Early Puberty

Early (precocious) puberty which is not caused by raised LH and FSH is more common in boys than girls, and in boys it is known as testotoxicosis. The testes develop on their own without stimulation from the pituitary gland. This rare condition tends to run in families and it is important to recognise because the treatment differs from true precocious puberty. The pattern or sequence of pubertal development is identical to that of true precocious or normal puberty.

Gonadotrophin independent precocious puberty does occur in girls but only in association with the rare syndrome of abnormal bone development and skin pigmentation called McCune Albright Syndrome. In this condition, boys can also develop early.

## Treatment of Early Puberty

### No treatment

In many cases of early precocious puberty, no treatment may be necessary. This is likely if the pubertal process is progressing slowly and/or the effect of early puberty on the child's final height will not be great. Explanation and supportive counselling may be the only treatment required.

"In many cases of early precocious puberty, no treatment may be necessary."

### GnRH Analogues

#### (Gonadotrophin Releasing Hormone Analogues)


This is a synthetic or manufactured form of the small protein, which normally stimulates the pituitary gland, as a signal to enter puberty. When GnRH is used as a treatment, it over-stimulates and 'exhausts' the pituitary gland, until that gland completely stops making the sex hormones and the physical changes of puberty are reversed.

When GnRH is first started, it stimulates the pituitary gland for a short time. Cyproterone Acetate (see next page) may be needed for the first month of GnRH treatment to block this effect. GnRH treatment must be given regularly to be effective. The depot preparations need to be given every month (or every 3 months in a bigger dose) to avoid breakthrough of any pubertal symptoms.

### Cyproterone Acetate (CPA)

#### (Androcur or Medroxyprogesterone Provera)

CPA is a steroid drug, which has a direct suppressing effect on the gonad (ovary or testes) and also a central effect on the hypothalamus or



pituitary, to help switch off the stimulatory GnRH hormone. Both CPA and medroxyprogesterone acetate (MPA) are drugs which are sometimes used to reverse the changes of precocious puberty. They are quite effective in terms of reducing the signs of puberty, such as breast and pubic hair, but are not strong enough to stop bone age advancing. Therefore their use does not change final height. They are used when the only reason to stop puberty is for social and psychological benefit. They can also have a side effect of suppressing cortisol production.

### Other Treatments

There are other drugs occasionally used such as ketaconazole, for the rarer forms of precocious puberty. If these are to be used then the specialist will explain this in more detail.

## Social Concerns Relating to Early Puberty

As the child who has early puberty will probably be taller than other children of the same age, it will be natural that people respond to this by treating him or her as older than they actually are. The parents, friends and the child's teachers, will have to remind themselves repeatedly of the child's age so that they do not demand too much from him or her. A 2 year old the size of a 5 year old, behaving according to age, with obvious lack of language skills, sucking a dummy and having tantrums is a situation which can be very difficult for parents to deal with. The child may show more awareness of sexual parts and masturbate which can create embarrassment, especially in other adults, and confusion in the child. Anti-perspirants, and more frequent baths and hair washing, may be necessary as sweating and body odour can be a problem. The child may feel embarrassed by the physical effects of puberty. All children want to look and act like friends of their own age. It is helpful to emphasise to the child that all girls and boys normally experience puberty but in his or her case it has occurred sooner than usual. It is important to tell the child the changes to his/her body are normal. The child should be allowed to participate in his/her usual activities, athletic and extracurricular events. Of course, they can be at a distinct advantage in physical activities.

It is important to encourage the child to discuss any worries that he/she may be having. However, if there are difficulties coping alone, there are child psychologists experienced in dealing with these problems and the specialist can provide a referral. Certainly an education assessment at school may be particularly helpful.

In the very young child, the difficulties are mainly for the parents. As the child gets older and becomes more aware of the physical differences between themselves and their friends it can be difficult to know how to



help, particularly with the embarrassment of their own bodies; not only of their shape but functions such as frequent erections, feeling and being emotionally unable to cope. Even though reassurance can be given that their friends will, in the future, 'catch up' in size and body shape when they reach the normal range for puberty, self-esteem in a young child can be extremely low and this might be the time to enlist the help of a child psychologist to benefit both the child and the parents. It is important to remember the timely intervention of psychological support may help prevent real distress as the child gets older.

Parents, relations and others, also have to cope with their own normal reactions to the precociously mature child, which may include alarm, distress, distaste, guilt and confusion. Parents may find support through contact with other parents who have, or had, similar problems to deal with particularly helpful. They are likely to feel isolated in their predicament and unprepared for the early sexual maturation of their child. Such advice and encouragement from other parents, or from professionals experienced in this field, will help parents to help their child as and when they encounter difficulties.

Children with precocious puberty generally demand attention and use their physical strength, height and size to achieve it. This can be confusing and irritating for older siblings and has an effect on the entire family. Again, this is where the help of a child psychologist may be of benefit.

It can be very helpful for parents of a child with precocious puberty to spend some time with the child's teacher explaining the situation. A big child is always treated as older than his or her years and can be given far

# Puberty and its Problems

too much responsibility and staff can have unreasonable expectations of performance. This can generate extreme anxiety in the child with early development, particularly as he/she is often good at schoolwork and very willing to help. The co-operation and understanding of a teacher can be enormously helpful. For a girl with the possibility of very early periods, knowing she can go to the teacher, use the staff toilet if necessary and be reassured that assistance is available, will be a great relief.





## Questions and Answers

### How should precocious puberty be explained to the child?

The child may have several questions regarding early puberty and its treatment. It is often helpful to reassure them that the pubertal changes in his/her body are normal and that most individuals will eventually have these changes but that they have happened sooner than usual to their body.

### What should friends, relatives and especially teachers be told?

Parents of other children can be cautious in encouraging friendships with the child and although it is not necessary to tell anyone about the child's problem, it may be helpful to explain their conditions and emphasise that the child is perfectly normal but has started puberty at an earlier than normal age. If the child is receiving injections, it can be explained that they are given to temporarily stop puberty, which slows down or stops sexual maturation. Even with successful treatment, behavioural difficulties may remain and it may be helpful to discuss these individually with the child's teacher. It may help to ask the specialist to write to the school.

### What will the child's final adult height be?

Final adult height depends on many factors and, in a condition like precocious puberty, is extremely difficult to predict. Parental heights play a significant role in the height of a child. The relationship between bone age and actual age is also important as an advanced bone age suggests less time for growth. If premature puberty was detected at an early stage, then the child will have a better chance of reaching close to his/her expected height. If, however it was detected at a later stage, then their bone age will be more advanced and this will limit the time remaining for growth and, therefore, will limit final adult height. Some children with true precocious puberty have a very mild form of the condition and may reach an entirely normal height as expected for the heights of their parents.

# Puberty and its Problems

## Does treatment help in controlling moodiness, tearfulness and irritability?

Generally, yes, as successful treatment will be associated with a decrease in sex hormone secretion. Moods may not be entirely due to hormonal changes; they may be linked to the child's reactions to physical changes in his/her body, to their perception of themselves as different from their peers, and to their perception of reactions from peers and adults. There may be a variety of reasons for moods, unexpected behaviour of various types, and irritability or tantrums. Exploration of these reasons is important and it is wise not to conclude that all problems in the child necessarily relate to the growth problem.

Younger children may not be able to respond to direct questioning about their behaviour. Thus, parents may find that the provision of space, time, appropriate play materials, as well as story telling opportunities, may help younger children to communicate their worries. Opportunities for discussion of strategies to deal with problems, consistent handling, and support by parents, can be helpful. Persistent or extreme mood disturbances and behavioural difficulties may suggest that the child has problems that need assistance from professionals outside the family. Parents should ask their paediatric specialist for the help of a child psychologist.

## How long is treatment continued?

Treatment to put puberty "on hold" usually lasts until the child reaches the appropriate age for puberty when the functions of their own hormones are allowed to recommence. Generally speaking, treatment is stopped when a child enters secondary school, when a girl is more likely to be able to cope with having periods. After stopping treatment, puberty will not suddenly advance but will progress at a normal rate. Sometimes, after



years of puberty suppression, it may take many months for it to switch back on after treatment is ceased.

### **Are there any side effects from treatment?**

There are no known serious side effects from GnRH analogue treatment. In some cases, however, headaches have been known to occur. The older treatments of cyproterone acetate and medroxyprogesterone are still used and are needed in gonadotrophin independent precocious puberty. They can be associated with fatigue and tiredness as they suppress the secretion of cortisol and sex steroids from the adrenal glands. It is very important that such children carry notification that extra steroids (hydrocortisone by injection) may be needed in situations of severe stress, such as severe infection, hospitalisation or surgery.

### **Will the child have normal fertility as an adult?**

All the available evidence is that the future fertility should be normal. The available evidence is that treatment with either cyproterone acetate or GnRH analogue does not interfere with long term fertility.

### **Can oestrogen in food and other chemicals cause children to mature much earlier?**

There is no evidence that food or environmental oestrogen is decreasing the age that children go into puberty in Australia. 'Outbreaks' of breast development in little girls have been associated with the use of oestrogen in poultry farming in some countries overseas, but never in Australia. The early time of development results from the 'secular trend', a product of good health and living standards.

## Glossary

### Adrenal Gland

A gland in the abdomen, above the kidneys which produces adrenaline and other hormones.

### Chronic

A term used to describe a disease or condition persisting for a long period of time, often for the remainder of the person's lifetime.

### Endocrine Gland

A gland that makes hormones and releases them into the blood. The pituitary, thyroid, adrenal, testes (testicles) and ovaries are all endocrine glands. All of the glands together make up what is termed the endocrine system.

### Endocrinologist

A doctor who specialises in the disorders of the endocrine glands or hormonal disorders.

### Familial

A condition or disease which is common to family members and is usually, but not always hereditary.

### Follicle Stimulating Hormone (FSH)

The hormone released by the pituitary gland, which stimulates the gonads to produce eggs or sperm.

### Gonadotrophin

Follicle Stimulating Hormone (FSH) and Luteinising Hormone (LH).



### Gonads

A term that refers to the sex gland, the ovaries in females and the testes in males.

### Growth Hormone

A hormone released by the pituitary gland, which promotes growth.

### Hormone

A chemical substance that is made by an endocrine gland and carries messages from one cell to another via the bloodstream. Hormones are chemicals that stimulate growth and sexual development and help to regulate the body's metabolism. There are a large number of hormones that have widespread effects on the body, such as cortisol, thyroid hormone and growth hormone. Normally the body carefully controls the release of hormones. Too much or too little may disrupt the body's delicate balance.

### Hypothalamus

Part of the base of the brain that controls the release of hormones from the pituitary gland.

### Luteinising Hormone (LH)

The hormone released by the pituitary gland, which stimulates the gonads to produce sex hormones.

### Menopause

Permanent cessation of the menstrual cycle.

# Puberty and its Problems

## Menstrual Cycle

The regular shedding of the inside lining of the womb which usually occurs monthly and only in females. This results in bleeding, which is termed menstruation and is often referred to as periods.

## Oestrogen

A group of female hormones that are produced by the ovaries from the onset of puberty and continuing until menopause, which controls female sexual development.

## Ovaries

Females have two ovaries, which produce the reproductive cells, i.e. eggs, and the hormone oestrogen.

## Ovulation

Usually occurs monthly as part of the menstrual cycle and specifically refers to the ovaries releasing matured eggs.

## Paediatric Endocrinologist


A doctor who specialises in the disorders of endocrine glands and hormones in children.

## Pituitary Gland

A pea-sized gland at the base of the brain, which releases a number of important hormones related to normal growth, development and fertility, including growth hormone.

## Progesterone

One of the female hormones that is produced mainly by the ovaries from



the onset of puberty and continuing until menopause, which controls uterine bleeding.

### Puberty

The process of physical changes when a child's body becomes an adult body and becomes physically capable of reproduction.

### Subareolar Mastectomy

Removal of breast tissue via an incision (cut) under the curve of the nipple line.

### Syndrome

A syndrome is a collection of characteristics that occur together and characterise a particular condition.

### Testes

The male reproductive glands, which produce sperm, the male reproductive cells, and the hormone testosterone.

### Testosterone

Most potent male sex hormone, which is produced in the testes (testicles) and controls male sexual development.

### Thyroid Gland

A butterfly-shaped gland in the front of the neck below the larynx, which makes the hormone thyroxine.

### Ultrasound

A diagnostic tool used to show images of internal body parts.

## Support organisations and further reading

### Australian Pituitary Foundation Ltd

PO Box 105 Kellyville NSW 2155

Ph: 1300 331 807

Email: [support@pituitary.asn.au](mailto:support@pituitary.asn.au)

[www.pituitary.asn.au](http://www.pituitary.asn.au)

### Australasian Paediatric Endocrine Group (APEG)

[www.apeg.org.au](http://www.apeg.org.au)

### The Endocrine Society

[www.endo-society.org](http://www.endo-society.org)

### The Hormone Foundation

[www.hormone.org](http://www.hormone.org)

### The Magic Foundation

[www.magicfoundation.org](http://www.magicfoundation.org)

### Pituitary Foundation UK

[www.pituitary.org.uk](http://www.pituitary.org.uk)

### Pituitary Network Association (USA)

[www.pituitary.org](http://www.pituitary.org)

### UK Child Growth Foundation

[www.childgrowthfoundation.org](http://www.childgrowthfoundation.org)

### UK Society for Endocrinology

[www.endocrinology.org](http://www.endocrinology.org)





## References for text

Sperling, MA. Pediatric Endocrinology. 3rd Edition. 2008. Saunders Elsevier.

Lifshitz, F. Pediatric Endocrinology. 4th Edition. Revised and expanded. 2003. Marcel Dekker.

Carel J-C., Eugster E, Rogol A, Ghizzoni L and Palmert M, on behalf of the members of the, ESPE-LWPES GnRH Analogs Consensus Conference Group. Consensus Statement on the Use of Gonadotropin-Releasing Hormone Analogs in Children. Pediatrics. 2009. 123(4):e752-762.

Eugster EA. Peripheral Precocious Puberty: Causes and Current Management. Hormone Research in Paediatrics. 2009. 71(Suppl. 1): 64-67.

Ma NA and Geffner ME. Gynaecomastia in prepubertal and pubertal men. Current Opinion in Pediatrics. 2008. 20(4): 465-470.

# Puberty and its Problems

Merck Serono is proud to bring you this booklet from the *Hormones and Me* educational series. We aim to provide readers with a better understanding of the issues relating to endocrine disorders particularly in children. We hope that you find it a valuable and helpful resource.

Please ask your doctor or nurse for further information on the resources available to you.

## The *Hormones and Me* series includes:

1. Growth Problems in Children
2. Turner Syndrome
3. Craniopharyngioma
4. Diabetes Insipidus
5. Puberty and its Problems
6. Delayed Puberty
7. Multiple Pituitary Hormone Deficiency (MPHD)
8. Congenital Adrenal Hyperplasia (CAH)
9. Growth Hormone Deficiency in Adults
10. Management of Emergency or 'Stress' Situations where Hypoglycaemia or Cortisol Deficiency Occur
11. Intrauterine Growth Retardation (IUGR)
12. Congenital Hypothyroidism
13. Klinefelter Syndrome



## DISCLAIMER

### Speak to an appropriate healthcare professional

The information contained in this booklet is a general guide only and should not be relied upon, or otherwise used, in place of medical advice.

Any medical information contained in this booklet is not intended as a substitute for informed medical advice. You should consult with an appropriate healthcare professional on (1) any specific problem or matter which is covered by information in this booklet before taking any action; or (2) for further information or to discuss any questions or concerns.

Whilst we have taken reasonable steps to ensure the accuracy of the contents of this booklet, it is provided on the terms and understanding that Merck Serono Australia Pty Ltd (and their respective officers and employees) and all other persons involved in the writing, development, publication, distribution, sponsorship or endorsement of this booklet, to the fullest extent permitted by applicable law, are not responsible for (1) any error or any omission from this booklet; (2) make no warranties, representations or give any undertakings either express or implied about any of the content of this booklet (including, without limitation the timeliness, currency, accuracy, correctness, completeness or fitness for any particular purpose of the booklet or its content); (3) are not responsible for the results of any action or inaction taken on the basis of any information in this booklet; (4) are not engaged in rendering any medical, professional or other advice or services; (5) expressly disclaim any and all liability and responsibility to any person in respect of anything done by any such person in reliance, whether wholly or partially, upon the whole or any part of the contents of this booklet.

Merck Serono Australia Pty Ltd  
ABN 72 006 900 830  
Unit 3-4, 25 Frenchs Forest Road East  
Frenchs Forest NSW 2086 AUSTRALIA  
MET-MAY-11-ANZ-05



Hormones and Me

## Puberty and its problems

This booklet is valuable reading for any child or adolescent experiencing problems with puberty.

It is also recommended reading for their family and friends.