

Hormones and Me Congenital Adrenal Hyperplasia (CAH)

This booklet is valuable reading for anyone with
Congenital Adrenal Hyperplasia.

It is also recommended reading for their family and friends.

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HORMONES AND ME CONGENITAL ADRENAL HYPERPLASIA (CAH)

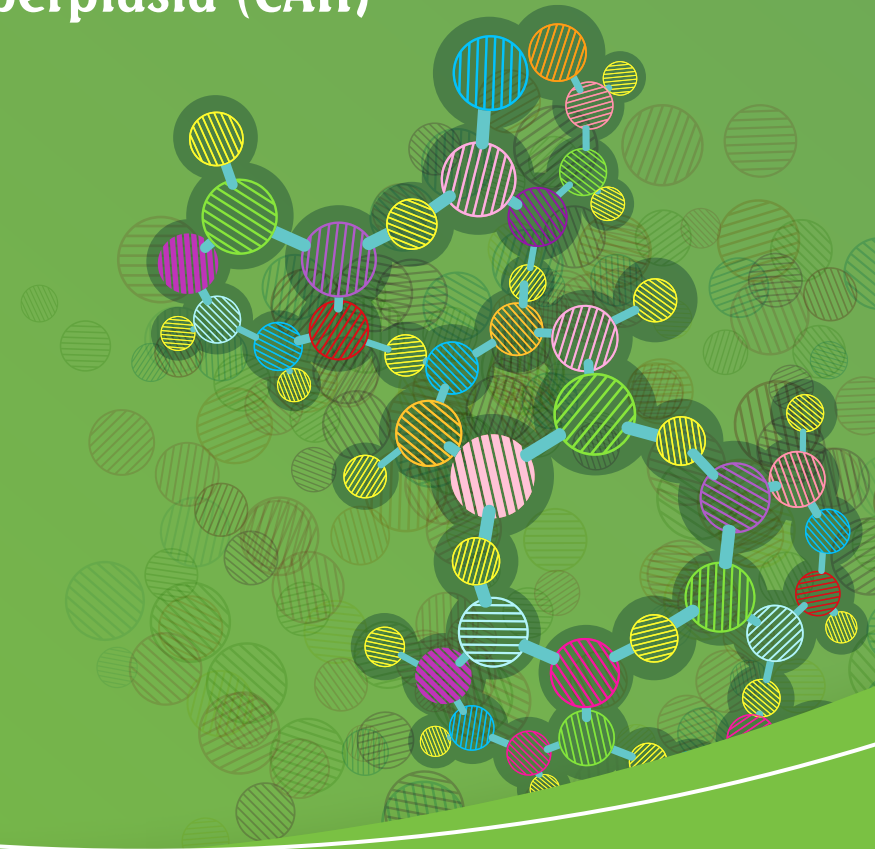
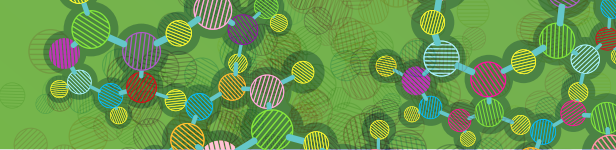




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About this book

This booklet, *Congenital Adrenal Hyperplasia (CAH)*, aims to provide a basic understanding of the role of the adrenal glands, how congenital adrenal hyperplasia affects adrenal function, the effect this has on growth and metabolism and the treatment options available.

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 A/Prof Maria Craig and Dr Ann Maguire (The Children's Hospital, Westmead, NSW, Australia), Paediatric Endocrinologists, members of APEG and Irene Mitchelhill, Endocrine Nurse (Sydney Children's Hospital, NSW, Australia). It was reviewed by Dr Catherine Choong (Princess Margaret Hospital, WA, Australia) and Prof Garry Warne (Royal Children's Hospital, VIC, Australia).

Paediatric endocrinologists, A/Prof Margaret Zacharin (Royal Children's Hospital, VIC, Australia) and Dr Ann Maguire 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 Garry Warne. Special thanks to the original authors and editors, Dr MDC Donaldson (Royal Hospital for Sick Children, UK), the late Dr DB Grant (Great Ormond Street, UK), Dr Richard Stanhope (Great Ormond Street Hospital for Children and the Middlesex Hospital, UK), Mrs Vreli Fry (Child Growth Foundation, UK) and the British Society of Paediatric Endocrinology (BSPE).

Introduction

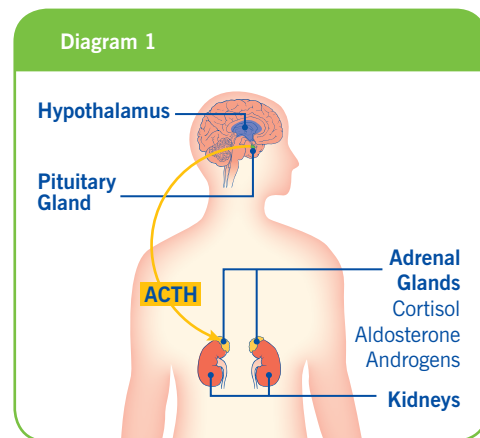
Congenital Adrenal Hyperplasia (CAH) is an inherited condition that affects the production of hormones from the cortex of the adrenal glands.

The term describes what the adrenals look like in this condition and can be translated as a thickening or enlargement (hyperplasia) of the adrenal glands before birth (congenital).

The adrenals are two small glands that lie on top of the kidneys (see *Diagram 1*). Each gland consists of two parts – the medulla (inside part) and the cortex (outside part). The cortex (outside part) of the adrenal glands produces three main hormones – cortisol, aldosterone and androgens. More details about what these hormones do is outlined on page 4. The adrenal

medulla makes adrenaline, the body's stress hormone.

It is the adrenal cortex and its hormones which are involved in CAH. The main hormone affected is cortisol and sometimes aldosterone is affected as well. Without treatment, cortisol and aldosterone levels tend to be low in CAH, while androgen levels tend to be high.



What Does the Adrenal Cortex Normally Do?

The hormones produced by the adrenal glands are essential for normal growth and metabolism.

The three main hormones – cortisol, aldosterone and androgens are made from cholesterol and their important functions are explained below.

Cortisol is an essential hormone that regulates energy levels, blood pressure, blood glucose levels and the immune system. Cortisol is important in helping the body combat stress (such as infection, illness or injury) by raising blood pressure and blood glucose levels when they are low, particularly in children.

Aldosterone helps to regulate salt levels in the body by controlling the amount of salt lost in the urine, sweat glands and gut. When the body's salt levels are low (which can lead to vomiting and dehydration), aldosterone makes the kidneys retain salt. When the body's salt levels are high (which can cause high blood pressure and fluid retention), the adrenal cortex reduces the amount of aldosterone produced, allowing the kidneys to pass excess salt in the urine.

Androgens are hormones produced by the adrenal glands in both males and females. Androgens (such as testosterone) stimulate the development of reproductive organs in males and contribute to the formation of pubic hair during normal puberty in both sexes. Testosterone is also produced by the testis and in small amounts by the ovary.

The Control of Cortisol Production

The amount of cortisol produced by the adrenal gland is controlled by the pituitary, a small gland at the base of the brain, which is connected to a part of the brain called the hypothalamus (see *Diagram 1*). When the body needs more cortisol, the hypothalamus stimulates the pituitary gland to release adrenocorticotrophic hormone (ACTH).

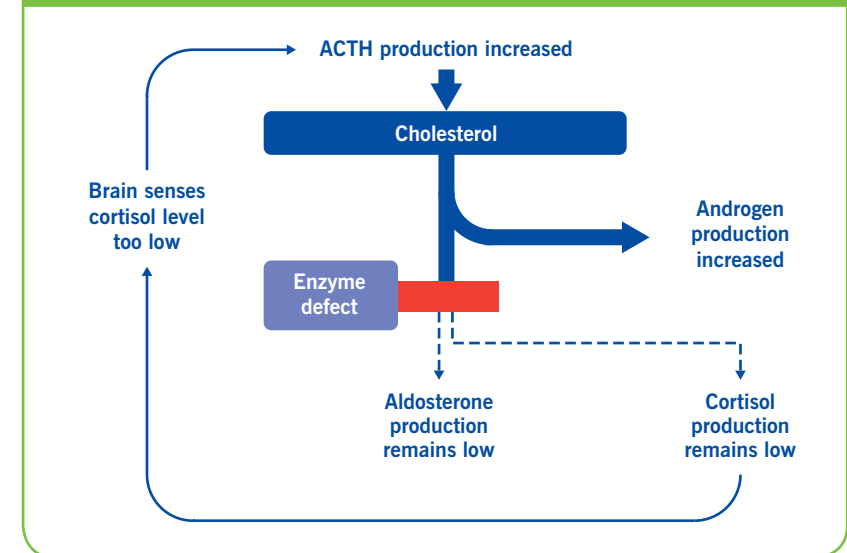
ACTH is released into the blood stream, reaches the adrenal cortex and stimulates the production of cortisol. As cortisol levels rise to normal levels, the hypothalamus senses this and stops the pituitary gland producing ACTH, which slows down the production of cortisol from the adrenal cortex.

What Goes Wrong in CAH?

The process of making steroid hormones from cholesterol in the adrenal cortex is complex and involves several steps controlled by enzymes. In CAH, a helper enzyme is missing or partly missing. This interferes with the production of cortisol and aldosterone (see *Diagram 2*).

When the pituitary gland senses low levels of cortisol in the bloodstream, it produces ACTH which over-stimulates the adrenal cortex causing it to increase in size. This causes the adrenal glands to produce excess androgen, while cortisol and aldosterone levels remain low.

Diagram 2





Types of CAH

There are three main types of CAH:

- 1 **Salt-losing CAH**
- 2 **Non-salt losing CAH**
- 3 **Late onset CAH (a milder form of CAH that may go undetected)**

The severe types of CAH are also known as 'classical CAH' while the milder form is known as 'non-classical CAH'. The type of CAH depends on the severity of the enzyme defect.

Salt-losing CAH

This form of CAH (also called 'salt-wasting CAH') results from a severe enzyme deficiency resulting in low levels of cortisol and aldosterone but high levels of androgen. Boys with this type of CAH may appear normal at birth and may have darkening of the genitalia. Usually the first signs of the condition are poor feeding, weight-loss and vomiting which occur between the first and second weeks of life. This is because low levels of aldosterone cause salt and water loss in the urine. This condition requires urgent medical treatment.

Girls with salt-losing CAH are more easily diagnosed. They often have genital abnormalities due to high levels of androgens produced by the adrenal glands before birth. The outer folds of the vagina (the labia) may be enlarged and joined together. The clitoris may also be enlarged and resemble a small penis, making it difficult to tell at first glance if the baby is a girl or a boy. The sex of the child may need to be confirmed by a blood test called karyotype which tests for the sex chromosomes (XX in girls or XY in boys). If the diagnosis is delayed, girls are prone to the same salt-losing problems as boys.

Non-salt-losing CAH

Children with non-salt-losing CAH are usually healthy and do not present with severe illness as a newborn. In girls, this form of CAH is usually diagnosed at birth because the clitoris is large and the labia are partially fused. Sometimes the changes may not be very obvious at birth, but the clitoris continues to grow after birth and becomes more obvious over time. Because aldosterone levels are normal or only slightly low, most children do not have the same problem with salt-loss as children with severe salt-losing CAH.

This form of CAH results from a milder enzyme defect resulting in slightly low or normal cortisol and aldosterone levels and high levels of androgen. Signs of the condition in early childhood include rapid growth and the early appearance of pubic hair. Boys may have enlargement of the penis and girls may have enlargement of the clitoris. These effects are due to excess androgens. Although these boys and girls tend to be tall for their age, if untreated they will usually be short adults. This is because the high levels of androgens cause the bones to mature rapidly and growth finishes earlier than normal.

Late onset CAH

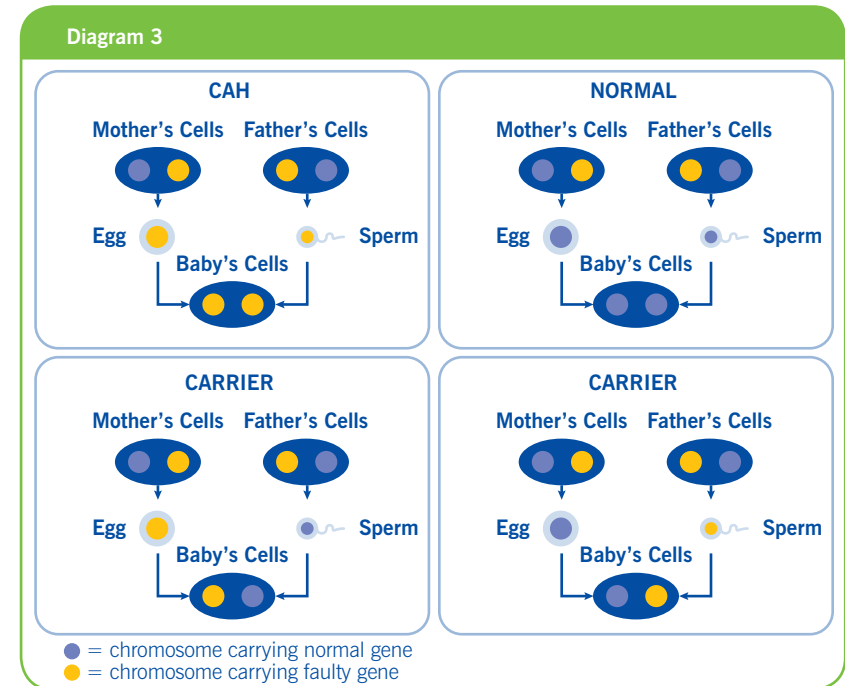
This form of CAH (also called 'non-classical CAH') is the mildest form. Signs of non-classical CAH may include rapid early growth and early appearance of pubic hair and acne. Sometimes the child seems normal until the time of puberty, when excess facial hair, and irregular periods occur. Men with non-classical CAH are often unrecognised, but they can also have reduced fertility and early beard growth.

Who can have CAH?

CAH is genetic condition. To understand how it is passed on it is necessary to know a little about chromosomes and genes. Chromosomes are thread-like structures contained in every cell of the body. Genes are tiny areas on the chromosomes containing genetic information. Genes determine a person's characteristics from the moment of conception. The information contained in the genes is essential for development and normal body functioning.

Every cell in the body contains 23 pairs of chromosomes, with one in each pair inherited from the mother and one from the father. CAH results when the genes for adrenal enzyme production are faulty, resulting in a change in enzyme function. Affected individuals inherit two copies of the faulty gene, one from each parent. Usually the parents do not have CAH because they have only one affected gene and one unaffected gene. The unaffected gene is dominant and overrides the faulty gene.

When two parents who each carry one affected gene have children, each child will have a one in four chance of having CAH (inheriting two faulty genes), one in four chance of being unaffected (inheriting two normal genes) and two in four chance of being a carrier like their parents (inheriting one faulty gene and one normal gene). This pattern of inheritance is known as autosomal recessive inheritance (see *Diagram 3*).



What happens when people with CAH have children?

CAH is a recessively inherited condition. This means that both parents must carry the abnormal gene for CAH and both must donate that gene, in order for a child to be born with CAH. If only one parent donates the abnormal gene to a child, that child will be unaffected but will be a carrier, like the parent.

For a person to have CAH, he or she must inherit 2 abnormal genes. A person with CAH can only pass an abnormal gene to their own children.



In the community, the chance of any person being a carrier is around 1 in 50. Provided the other parent does not carry an abnormal CAH gene (ie 49/50 chance), all children of the person with CAH will just be carriers and none will have CAH.

If the other parent is a carrier then the chance of a person with CAH having a child with CAH is one in two.

Diagnosis of CAH

A doctor may notice CAH by physical appearance, symptoms or through a family history of the disorder. To confirm the diagnosis, the doctor may take blood and urine tests measuring the levels of cortisol and other hormones.

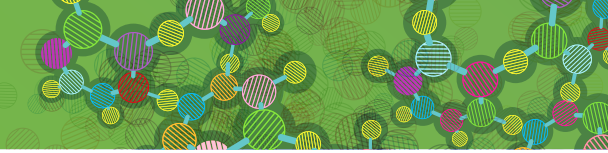
Diagnosis of CAH carriers

Measuring steroid levels in the blood and urine can help family members determine if they are carriers for CAH. However, a more accurate and reliable way to detect carriers of CAH is to perform genetic testing.

Prenatal diagnosis

CAH can be diagnosed before birth in families who already have a child with CAH. This can be done by chorionic villus sampling (CVS) or amniocentesis. CVS is usually performed during the 10th to 12th week of pregnancy and involves testing placental tissue. Amniocentesis is usually performed during the 14th to 18th week of pregnancy and involves testing a sample of the amniotic fluid which surrounds the unborn baby.

If you already have a child with CAH, and if you are thinking of becoming pregnant or do become pregnant, it is important you advise your doctor as soon as possible so that genetic testing can be done before falling pregnant or early in the pregnancy.



Available Treatment for CAH

The aims of treatment in CAH are to allow:

- 1 **Normal salt and water balance**
- 2 **Avoidance of adrenal crisis**
- 3 **Normal blood glucose levels, particularly during the newborn period and times of physical stress, fever or illness**
- 4 **Normal growth and sexual development.**

This means replacing the hormones that are deficient. Treatment is required lifelong and relies on close medical supervision, regular review and dosage adjustments.

Cortisol is replaced by treatment with a synthetic steroid called hydrocortisone. Less commonly, synthetic steroids called prednisolone or dexamethasone may be used in older adolescents and adults, so that frequency of dosing is reduced. Prednisolone and dexamethasone are usually not first choice treatment for the growing child as they have a longer duration of action than hydrocortisone and sometimes interfere with normal growth. All these medications are relatively cheap and available as tablets. Hydrocortisone is also available as an injection.

The hydrocortisone dose must be tailored to each child's individual need and is usually given 3 times a day. In healthy people the body's cortisol level rises at times of stress such as infection, injury or surgery. Therefore extra hydrocortisone must be given to patients with CAH at times of stress. This is necessary to prevent low blood pressure and low blood glucose levels (hypoglycaemia). The doctor will advise of the dose change necessary in a particular situation.

In children with salt-losing CAH due to low aldosterone levels, replacement of both cortisol and aldosterone is necessary. A synthetic hormone similar to aldosterone called fludrocortisone is given to prevent the loss of salts in the urine. Fludrocortisone is available in tablet form and is given once or twice a day. In the first year of life, children with salt-losing CAH may also require salt supplements, usually added to feeds. After one year of age the combination of fludrocortisone and dietary salt is usually sufficient to maintain salt balance.

Prenatal Management

It is possible to protect the genitalia of an unborn female with CAH from the effects of excess androgen by treating the mother with the synthetic hormone dexamethasone during pregnancy, provided it is started before 9 weeks and the dose is adequate. Dexamethasone is similar to hydrocortisone, except that it crosses the placenta and enters the baby's blood stream where it suppresses the production of ACTH from the baby's pituitary gland. This helps to prevent the baby's adrenal glands from producing excess androgens that are responsible for the genital abnormalities in CAH.

All women with CAH aiming for pregnancy or in the very early stages of their pregnancy should be made aware of the possibility of maternal dexamethasone treatment in early pregnancy to prevent virilisation of the female fetus. This treatment is still regarded as experimental and is advised to take place only under supervision by a specialist as part of a specific research protocol. However, with appropriate counselling of the parents about risks and benefits, the treatment can be considered under the care of an endocrinologist at a tertiary centre familiar with its use.



Pre-implantation genetic diagnosis is also an option for families who already have an affected child with CAH and know which genetic mutations they carry. Although pre-implantation genetic testing is expensive, families may prefer this, and dexamethasone treatment during pregnancy would therefore not be required.

Special Needs of Girls with CAH

Some girls with CAH will have corrective surgery to their genitalia. Surgery is usually performed in infancy but it may be necessary to have further procedures later in life. Surgery normally involves reducing the size of the clitoris (while preserving sensation), separating the fused labia and enlarging the vaginal opening. The ovaries, fallopian tubes, uterus and upper two thirds of the vagina are not affected by the hormone changes that alter the outside genital appearance. The uterus, ovaries, fallopian tubes and upper vagina are always normal unless the girl has some entirely separate problem unrelated to CAH.

Fertility

With modern treatment regimes most women with well controlled CAH can expect to be fertile. If their condition is complicated by secondary polycystic ovary syndrome, fertility induction may take a little more time than average to achieve, but should be possible.

During pregnancy in a woman who has CAH, androgen levels rise rapidly in the second trimester (or middle to later months of pregnancy). Significant increases in her steroid doses are necessary to prevent minor virilizing changes in the female foetus.

Extra care needs to be taken around time of birth. Specialist obstetric advice must be sought as to the possible need for elective Caesarean section if the woman has required a lot of previous reconstructive surgery.

Labour is a time of major stress and extra steroids are required at the time, usually via intravenous injection, along with plenty of glucose containing fluids.



A paediatrician should attend the birth. The infant may have adrenal suppression for a few days, due to the mother's need for high dose steroids before the birth. Hypoglycaemia (low blood sugar) is a risk for the first 3-4 days and the baby should be monitored carefully for this possibility.

The mother's steroid doses can return to normal 2-3 days after the birth.

Some women with CAH who have had surgery may have difficulties with sexual intercourse, such as vaginal dryness or tightness. A gynaecologist should be consulted if this problem arises.

It is possible some girls with CAH may experience uncertainty in adolescence about whether they are heterosexual or not. However, tomboyish behaviour is not a predictor of future sexual orientation.

Important tips for patients with CAH

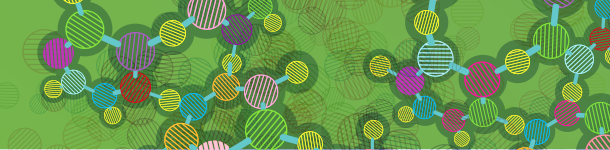
CAH is a rare condition in the community. Many GPs and even paediatricians have never seen or treated a patient with this problem. CAH is also used as an abbreviation for "Chronic Active Hepatitis", so it is very important if you are attending a new doctor or hospital, to explain that the child has "Congenital Adrenal Hyperplasia". It is very sensible to always carry a letter from the specialist, explaining the nature of the condition and how to manage an emergency situation. This is particularly important when travelling away from the child's home area to a place where a doctor would not be familiar with the child.

If a child with CAH becomes ill or suffers an injury it is important to contact his or her specialist for advice regarding the adjustment of their hydrocortisone dose. As a general guideline the following may be useful.

If the child has a minor illness such as a mild cold but is otherwise well, no increase in hydrocortisone dose is required.

If the child has:

- An illness such as a fever, chest infection or tummy upset, severe enough to prevent normal activities or miss a few days of school, it is advisable to give three times the daily dose of hydrocortisone. This should be done in consultation with your child's local doctor, using the doses advised by your child's specialist.
- In severe illness, especially when associated with diarrhoea and vomiting, the child will need hydrocortisone urgently given by injection.



Children with CAH (particularly those with the severe salt-losing form) can become seriously unwell very quickly.

An unnecessary dose of hydrocortisone is not dangerous but delaying the dose in a sick child can be disastrous. Always contact the doctor in this situation for advice.

In an emergency where the child is shocked (pale, clammy, drowsy or unconscious) a hydrocortisone injection should be given immediately and an ambulance called.

The recommended doses of hydrocortisone are:*

Age and Weight (Kg)	Dose of hydrocortisone
≤6 months (≤7 kg)	25 mg
6 months–2 years (8–12 kg)	50 mg
3–10 years (13–30 kg)	75 mg
>10 years (>30 kg)	100–200 mg

* The doses in this table are based on a recommended stress dose of hydrocortisone (60–100mg/m²) assuming average weight, height and body surface area for the stated age ranges. As the age and weight ranges in each category are wide, this generic advice is to be used in emergency situations only. More accurate individualised advice can be provided by your specialist during routine clinic visits depending upon your child's height and weight.

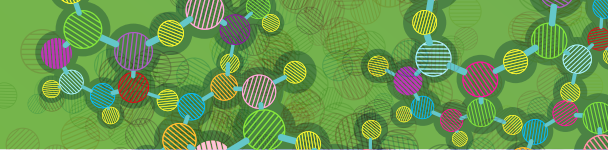
The child should be taken to hospital so they can be given fluids and salt by an intravenous drip. Blood glucose should be monitored. The dose of hydrocortisone should be repeated if there is a poor response after the initial treatment with hydrocortisone and intravenous fluids.

Any surgical procedures requiring general anaesthetic are likely to require additional hydrocortisone therapy. Consult the specialist for advice. Dental extractions under local anaesthetic do not usually necessitate special treatment but the dentist should be advised of the child's condition.

Children with CAH should wear a medical alert bracelet stating “Adrenal Insufficiency, in emergency give Hydrocortisone” so that appropriate treatment can be given in an emergency. It is also wise for them to carry a letter from their specialist when travelling overseas explaining the condition and any medications they may have with them.

It is advisable to tell all treating doctors that the child has congenital adrenal hyperplasia rather than using the acronym CAH. This is because ‘CAH’ can also mean chronic active hepatitis and it is extremely important that any treating doctor is very clear that the child has congenital adrenal hyperplasia and adrenal insufficiency, NOT chronic active hepatitis.

More information about management of acute stress, illness, hypoglycaemia etc is available in the booklet, *Management of Emergency or ‘Stress’ Situations where Hypoglycaemia or Cortisol Deficiency Occur*, which is also part of the Merck Serono Australia *Hormones and Me* series.



Questions and Answers

Will a child with CAH reach a normal adult height?

With careful treatment it should be possible for children with CAH to achieve a normal adult height. However, even with the very best treatment it is not always possible to achieve perfect control and some children with CAH do not reach their potential adult height. Also, if a child is not treated until a later age, he or she may become a short adult.

Is steroid therapy harmful?

If the correct dose is used, there should be no side effects as the treatment is replacing natural hormones that are deficient. However, if too much hydrocortisone is given over a long period of time it can result in slowing of growth and weight gain. Too much fludrocortisone can cause high blood pressure, but this is usually temporary and responds to dose reduction.

How is the dosage of steroid determined?

The dose varies between individuals. In general, non-salt-losers will require lower doses than salt-losers. As the child grows, the dose will be increased and may rise quite steeply at puberty. Each child should be monitored closely by the paediatric endocrinologist and doses adjusted to their individual needs. The child's growth rate is one of the most reliable markers for determining hydrocortisone dose although blood tests are also useful. Blood pressure monitoring and blood tests are also usually done to monitor the levels of adrenal hormones including 17 Hydroxyprogesterone (17-OHP) and a test is done to measure the adequacy of salt replacement.

At what time of the day should treatment be given?

Opinions vary on the best time to give hydrocortisone. It should usually be given 3 times throughout the day. The child's paediatric endocrinologist will advise the exact dose and times of treatment that suits the child.

Can your child receive live vaccinations while on hormone replacement therapy?

Yes. The dose of hormone replacement in CAH is equivalent to the amount produced naturally by the body and will not interfere with the body's response to vaccination. Children with CAH should receive all the recommended vaccinations. Children should be well before having immunisations. The situation may be different for children on high dose steroids for other medical conditions.

How often should your child be medically assessed?

Regular medical assessment and monitoring of treatment is the key to the successful management of CAH. Regular assessment of growth, bone maturation, blood pressure and blood tests help the paediatric endocrinologist decide on the best treatment plan. Generally a visit to the paediatric endocrinologist or clinic 3-4 times a year will be necessary. It is also important to have a local doctor who is easily accessible and familiar with the child's condition.

Can your child live a normal life?

Yes. Although not curable, CAH is a very treatable condition. With careful management, children with CAH can lead normal lives and should have a normal life expectancy. Although there are many issues that a person with CAH may face, there are people who can help. Paediatric and adult endocrinologists, gynaecologists, fertility specialists, psychologists, counsellors and family support groups can all play vital roles in helping children and adults with CAH live healthy lives and assist with any issues that may arise.



Glossary

Adolescence

The period in development between the onset of puberty and adulthood.

Aldosterone

A steroid hormone produced by the adrenal gland that helps regulate salt concentration in the blood.

Amniocentesis

A procedure in which a small sample of amniotic fluid is drawn out of the uterus through a needle inserted in the abdomen. The fluid is then analysed to detect genetic abnormalities in the baby or to determine the sex of the baby.

Amniotic Fluid

The liquid surrounding a baby in the womb.

Androgen

Androgens are steroid hormones which are produced by the adrenal glands in both males and females. These adrenal androgens contribute to the formation of pubic hair during normal puberty in both sexes. Androgens are also produced in larger amounts in the testis of males, and are responsible for the majority of male pubertal development. Excess androgens are produced by the adrenal glands in people with CAH.

Cholesterol

A substance found in animal and plant tissues. It is essential in humans for the production of steroid hormones.

Chorionic villus sampling (CVS)

A prenatal test to detect birth defects that is performed at an early stage of pregnancy and involves collection and examination of tissue from part of the placenta.

Chromosome

A thread-like structure that carries genetic information in the form of genes composed of DNA. Normally, each human cell contains 23 pairs of chromosomes and one pair of these are the sex chromosomes (XX in girls or XY in boys). Genes and chromosomes are like blueprints for the body's development and so play a large part in determining a person's characteristics.

Clitoris

Part of the external female genitalia, a small button-like sensitive organ above the opening of the vagina.

Congenital

A feature or condition that is present from birth, but not necessarily hereditary.

Corticosteroids

Steroid hormones produced by either the adrenal gland (eg cortisol, aldosterone, 17 hydroxyprogesterone) or produced synthetically (eg hydrocortisone, prednisolone, dexamethasone).

Cortisol

A steroid hormone produced by the adrenal gland. There are a number of hormones made by the adrenal gland and they are called corticosteroids (see above).



DNA

Stands for Deoxyribonucleic Acid and is the chemical that forms the genetic code.

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 conditions of the endocrine glands, including congenital adrenal hyperplasia.

Enzyme

A special protein, formed in a living cell, which helps chemical reactions occur (eg changing one substance into another).

Genes

Substances that convey hereditary characteristics, consisting primarily of DNA and proteins and occurring at specific points on the chromosome.

Gynaecologist

A doctor who specialises in the conditions of the female reproductive system.

Hormones

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, aldosterone, thyroid hormone, growth hormone and insulin. Normally the body carefully controls the release of hormones. Too much or too little may disrupt the body's delicate balance.

Hypoglycaemia

A low level of glucose in the blood.

Hypothalamus

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

Ovaries

Females have two ovaries, which produce the reproductive cells, ie eggs and hormones including oestrogen.

Paediatric Endocrinologist

A doctor who specialises in the conditions of endocrine glands in children.

Pituitary Gland

A pea-sized gland at the base of the brain, which releases a number of important hormones. Some of these have a direct action on the body, such as growth hormone, whilst others stimulate hormone production from other glands in the body, such as the thyroid gland, adrenal glands and ovaries or testes (see *Diagram 1*).

Placenta

The organ which connects the foetus to the wall of the uterus. The placenta provides the foetus with nourishment and eliminates wastes.

Scrotum

The pouch of skin and thin muscles that holds the testes and hormones, including testosterone.

17 hydroxyprogesterone

A steroid hormone produced by the adrenal gland which is usually elevated in the most common forms of CAH.

Testes

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

Uterus

Also known as the womb. This is the muscular organ in the pelvis of females which contains the developing foetus.

Virilisation

The abnormal development of male sexual characteristics in a female (often as the result of a hormone imbalance).

Support Organisations and further Reading

Australasian Paediatric Endocrine Group (APEG)

www.apeg.org.au

Adrenal Hyperplasia Network UK

www.ahn.org.uk

CAH Support Group Australia Inc

PO Box 100

Mitcham VIC 3132

Australia

Tel: (03) 9513 9255 (answering service)

or + 61 3 0513 9255 (International)

www.cah.org.au

CARES (Congenital Adrenal Hyperplasia Research Education & Support) Foundation

www.caresfoundation.org

Congenital Adrenal Hyperplasia Education and Support Network

www.congenitaladrenalhyperplasia.org

CLAN (Caring & Living as Neighbours)

www.whatisclan.org

Congenital Adrenal Hyperplasia Support Group New Zealand

www.cah.org.nz

Intersex Society of North America

www.isna.org

The Hormone Foundation

www.hormone.org

Living with CAH support group (UK)

www.livingwithcah.com

The Magic Foundation

www.magicfoundation.org/www/docs/100/congenital-adrenalhyperplasia

UK Society for Endocrinology

www.endocrinology.org/public

Your Child with Congenital Adrenal Hyperplasia (Warne G)

www.rch.org.au/cah_book/index.cfm?doc_id=1375

(also translated into French, Vietnamese and Chinese)

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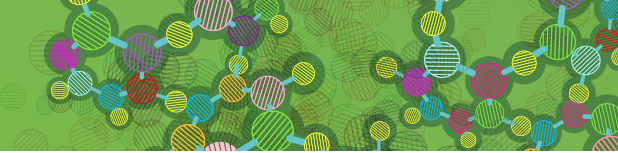
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Speak to an appropriate healthcare professional

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ME-MAY-15-AU-0004. Date of preparation: June 2015.