

# Hormones and Me Diabetes Insípíduş



Australasian Paediatric Endocrine Group



Hormones and Me

# Diabetes Insipidus



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## About this book

This booklet, *Diabetes Insipidus* should give you a basic understanding of the nature and causes of diabetes insipidus and provide an outline of the treatments that are available.

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

Merck Serono Australia is pleased 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 Professor Jenny Couper and Dr Alexia Peña, (The University of Adelaide and Women's and Children's Hospital, SA, Australia), Paediatric Endocrinologists specialising in childhood endocrine disorders and members of the Australasian Paediatric Endocrinology Group (APEG).

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 Couper. 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), Dr David Dunger (John Radcliffe Hospital, UK), Ms Janis Clayton (Serono Laboratories, UK) and the British Society of Paediatric Endocrinology (BSPE).



## Introduction

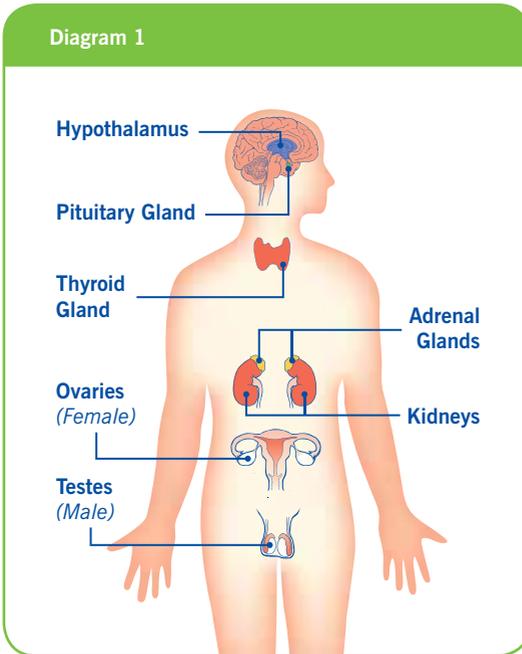
This booklet describes a condition called diabetes insipidus. It results from a deficiency of the hormone vasopressin, which is normally produced by the pituitary gland located under the base of the brain.

There are several important underlying conditions, which can cause this problem. Early detection and treatment of the underlying problems is essential.

## Hormones

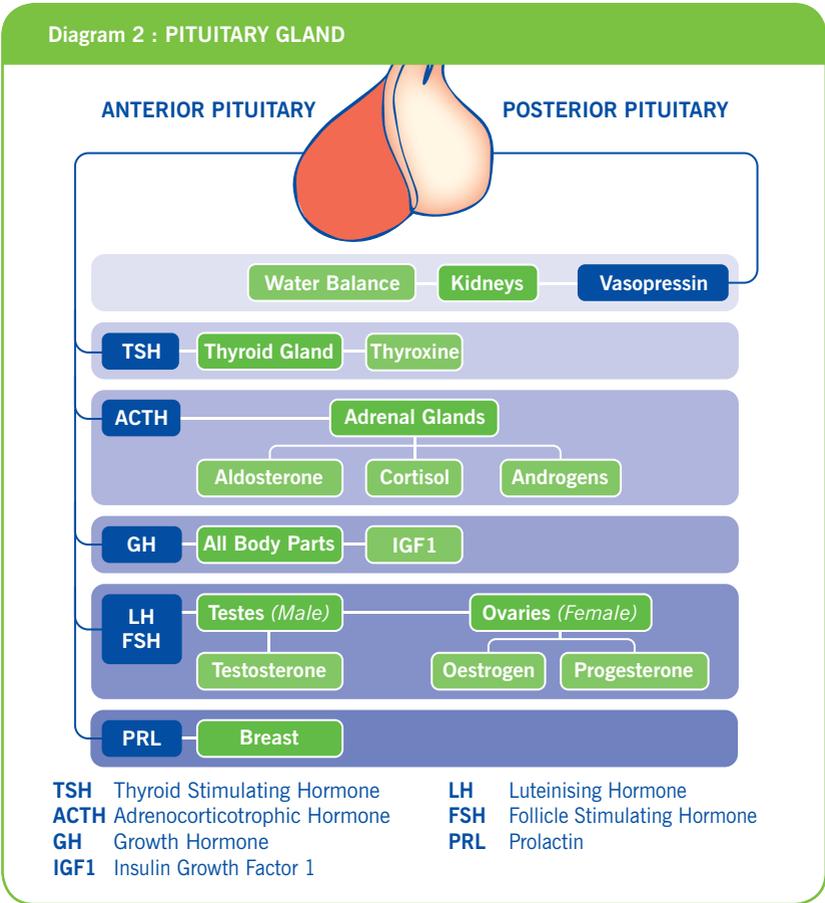
Hormones are chemicals that carry messages from one cell to another. A hormone is produced in one area of the body and carried via the bloodstream to another different area where it produces its effect.

A part of the brain called the hypothalamus controls the level of many hormones in the blood by triggering the pituitary gland into producing the required hormones. Low or absent hormone levels in the blood can occur when there is a problem in the hypothalamus, pituitary gland or the stalk connecting them.



## Pituitary Gland

The pituitary is a pea-sized gland which is located in the midline, under the brain, just below the hypothalamus. It receives signals from the hypothalamus to stimulate the release of hormones which affect many functions in the body (see *Diagram 2*).



The pituitary is divided into two areas (lobes). These are called the anterior (front) and the posterior (rear) lobes. Secretion of vasopressin (also called antidiuretic hormone or ADH) from the posterior lobe controls the amount of fluid in the blood, and therefore its concentration. Oxytocin, another hormone released from the posterior lobe, triggers the start of labour contractions at the end of a pregnancy.

The hormones released from the anterior lobe of the pituitary are growth hormone (GH), the gonadotrophins (luteinising hormone (LH) and follicle stimulating hormone (FSH)), thyroid stimulating hormone (TSH), adrenocorticotrophic hormone (ACTH), and prolactin (see *diagram 2*).

Although the terms vasopressin and antidiuretic hormone (ADH) can be used interchangeably, in this booklet we will use the term vasopressin.



## What is Diabetes Insipidus?

Diabetes insipidus is a condition caused by an abnormality of the pituitary gland which leads to a deficiency of the hormone vasopressin. When a person has diabetes insipidus, this affects the body's ability to control the level of fluid in the blood and urine. As a result, there is no stimulus for fluid to be retained in the body and so it is lost in the urine which becomes very dilute and is passed in large quantities. Due to the excessive urine loss, a person with diabetes insipidus will usually feel very thirsty.

“Diabetes insipidus is not the same as the more common condition diabetes mellitus, which is better known as sugar diabetes.”

Diabetes insipidus is not the same as the more common condition diabetes mellitus, which is better known as sugar diabetes. Diabetes mellitus is relatively common and is a disorder of the pancreas where the body is unable to control the level of sugar in the blood. Both conditions have similar symptoms of excessive thirst and passing of large amounts of urine. The treatment of diabetes mellitus involves regular injections of insulin or taking tablets to control sugar levels and careful monitoring of levels of sugar in the blood.

It is very important not to confuse the two conditions called 'diabetes' because they have different causes and very different treatments. This booklet is about the condition diabetes insipidus.

## Types of Diabetes Insipidus

There are two types of diabetes insipidus:

### **Cranial Diabetes Insipidus**

This is caused by a deficiency of the hormone vasopressin, which results in the kidneys not being given the signal to retain fluid and so large quantities of fluid are lost as very dilute urine. Because fluid is being lost from the body in this way, the blood becomes too concentrated.

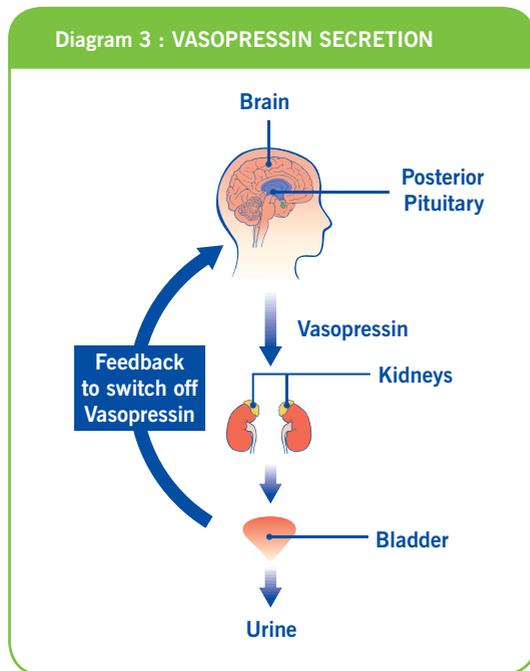
If a normal person loses extra fluid from the body, for example by sweating, not drinking enough on a hot day, or with a fever, this produces a higher salt concentration in the bloodstream. The thirst centre in the hypothalamus, which sends a message to the pituitary gland to release vasopressin, will detect this. In people with diabetes insipidus, there is a lack of vasopressin and the body does not keep water to balance the salt concentration. Excess water is continually being lost from the body via urine and the person may become dehydrated if the loss is severe. The only way a person with diabetes insipidus can make up the loss is by drinking large quantities of water.

### **Nephrogenic Diabetes Insipidus**

This is due to an abnormality of the kidneys where they are not able to respond to the vasopressin stimulus. In this different condition, large quantities of fluid are also passed out of the body in the form of urine. Nephrogenic diabetes is a kidney disorder and will not be further discussed in this booklet.

# The Control of Fluid Levels in the Body

Control of fluid levels in the body is important so that the blood does not become too concentrated or too dilute. If too much fluid is lost from the body in the form of large quantities of dilute urine, the blood becomes too concentrated. An area of the brain called the hypothalamus recognises if blood becomes too concentrated, and sends a message to the posterior lobe of the pituitary gland to release the hormone vasopressin. This hormone is carried in the blood stream to the kidneys, giving them the message to reduce the amount of fluid being lost in the urine. A smaller volume of more concentrated urine is then passed, the level of fluid in the blood increases and the blood concentration returns to normal.



If blood becomes too dilute, the hypothalamus sends a message to the pituitary to switch off vasopressin secretion. The kidneys will then allow larger volumes of more dilute urine to be excreted. The increase in fluid being lost from the body as dilute urine means that the concentration of the blood returns to normal (see *Diagram 3*).

## The Causes of Diabetes Insipidus

Diabetes insipidus is usually caused by a change or abnormality in either the pituitary gland, the stalk connecting the pituitary to the brain, or within the hypothalamus itself. These changes can be due to the presence of a cyst or tumour (e.g. craniopharyngioma or germinoma) or by the infiltration with a chronic inflammation. The symptoms of excess thirst and urine excretion may be the first signs that there is something wrong. Diabetes insipidus may occur on its own, or together with other pituitary hormone deficiencies (multiple pituitary hormone deficiency or MPPH) as will be described in more detail later in this booklet.

Diabetes insipidus may occur without an identified cause. This is called idiopathic diabetes insipidus. It is very important that an endocrinologist carefully checks all people with diabetes insipidus on several occasions, over months or years. This is to ensure that a small tumour does not cause the problem, which may have not been visible when the person was first investigated. This is particularly important in children with a diagnosis of 'idiopathic' diabetes insipidus.

Very rarely, diabetes insipidus is passed from the parents to the child (hereditary). In some cases it may affect the newborn baby who will have problems with dehydration but in other cases the symptoms may not appear until the child is up to one year old. This cause is very unusual.



Finally, diabetes insipidus can result from surgery to the area in or around the pituitary gland. This type of diabetes insipidus may be temporary, lasting only a few days and requiring little or no treatment. However, in some cases, the diabetes insipidus may be permanent.

Whatever the cause, it is important that all children with diabetes insipidus are assessed by a specialist. The types of investigations they may need include special scans (either a Computer tomography [CT] or Magnetic resonance imaging [MRI]) of the brain to check whether a cyst or tumour is present. These scans may need to be repeated every six to twelve months.

Whatever the cause, it is important that all children with diabetes insipidus are assessed by a specialist

## Symptoms of Diabetes Insipidus

The most common symptom in people with diabetes insipidus is passing large volumes of urine. This usually means that there is a need to go to the toilet frequently, often during the night, which results in disturbed sleep. Bladder control usually remains normal. When a person has uncontrolled diabetes insipidus however, the urine volume is so high that bedwetting can be a problem, especially in children and teenagers. Large losses of water from the body results in a great increase in thirst, to make up for the lost fluid. Therefore in individuals with diabetes insipidus, thirst becomes the regulator of water balance in the body. A person with diabetes insipidus may drink 6 to 20 litres of water per day, although in partial diabetes insipidus the amounts may be less.

“The most common symptom in people with diabetes insipidus is passing large volumes of urine.”

It is often possible for a person with diabetes insipidus to keep up with the fluid loss by drinking a great deal. However, if the condition is very severe, dehydration may occur. This may be difficult to recognise and manage in small babies as they do not always have the increased thirst and therefore the only signs may be constipation and a failure to gain weight as a result of dehydration.



In some people, diabetes insipidus is sometimes seen following surgery for a type of tumour at the base of the brain called craniopharyngioma. In such cases the control of fluid balance may be very difficult, as the thirst centre may also be affected. In such individuals, although they lose a lot of fluid in large volumes of dilute urine, they do not get a feeling of thirst. It is very important for people with this complex condition to monitor fluid balance extremely carefully. Replacement of fluid losses needs to take into account the losses that occur in hot weather. A regimen for care needs to use a constant amount of daily fluid intake to balance losses, and to include differences depending on the weather and losses due to heat. This situation is potentially dangerous and needs very careful monitoring of fluid intake and loss.

## How is the Diagnosis Made?

The diagnosis of diabetes insipidus can usually be made by comparing the concentration of salt and water in blood (serum osmolality) and urine (urine osmolality) in early morning samples. This needs to be done after an overnight fast and before the person has eaten or drunk anything. If the problem seems to be severe when the affected person is first seen by a doctor, it may be dangerous to undertake an overnight fast as dehydration may occur during this time. Under these circumstances, the fast should occur in hospital during the day.

If this test does not confirm the diagnosis, a special test may need to be carried out called a 'water deprivation test'. This is done in hospital and the person is admitted for the day, but not overnight.

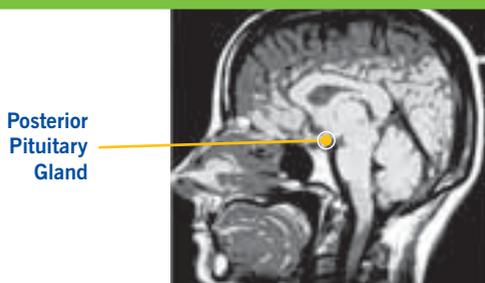
For this test the patient is asked not to drink fluid for up to 6-8 hours (infants) and sometimes up to 12-16 hours in older children and adolescents. During this time the patient's weight, as well as concentration of the blood and the urine, are checked regularly. Again, if the concentration of the blood is high and the concentration of the urine is low, this confirms the diagnosis of diabetes insipidus. The test may be stopped early if there is obvious evidence of excess fluid loss and increased concentration of the blood.

The administration of vasopressin at the end of the test will tell whether the cause is cranial or not. If it is cranial, the kidneys will respond to the administered hormone and there will be a rapid reduction in the volume of urine passed. The concentration of the blood will then return to normal. It is very important that all of the urine is collected. However, the test will be stopped if there is too great a loss of urine such that it affects body weight.

Confusion as to diagnosis may occur in young children if they have a urinary infection as this may cause large volumes of urine to be passed. Also, children with epilepsy who pass urine during a fit can be suspected of having diabetes insipidus. Obsessive or habit drinking, also called polydipsia, may also be confused with diabetes insipidus. Habit drinking is more common in the toddler age group, but can also occur in older children and adults.

Some children require imaging of their brain using magnetic resonance imaging (MRI) to look at the posterior pituitary gland where vasopressin is produced (*Figure 1*). MRI makes images of the body without the use of X-rays or radiation, because it uses magnetic fields and radio waves to create images, these magnetic fields and radio waves are safe and no adverse health effects have been reported.

Figure 1



The distinction between diabetes insipidus and diabetes mellitus is quite simple as patients with diabetes mellitus have large concentrations of sugar in their urine which can be tested for by using a simple urine test.

## Diabetes Insipidus And Multiple Pituitary Hormone Deficiency (MPHD)

Diabetes insipidus usually occurs on its own without any additional pituitary hormone deficiencies being present. However, there are occasions when diabetes insipidus and MPHD occur in the same individual. This is rare when the MPHD is due to an unknown cause but is more common when the MPHD is secondary to a tumour that is present in the area of the pituitary gland. Also, if there has been damage to the pituitary gland as a result of surgery in the area, there is a risk of MPHD and diabetes insipidus occurring together. Diabetes insipidus does not occur as a result of radiation therapy for such a tumour.

Individuals with MPHD may not always be aware that they also have diabetes insipidus. Both deficiencies of cortisone and thyroid hormone cause the body to be unable to excrete a water load properly. If a person has MPHD, which is either untreated or undetected, a diagnosis of diabetes insipidus may be missed, due to inability to excrete water. Once the missing hormones are replaced, the kidney can then remove more water and diabetes insipidus may be uncovered.

Children with congenital abnormalities of the brain and eyes such as septo optical dysplasia can have diabetes insipidus and MPHD. Diabetes insipidus or MPHD can occur at any time in their life.



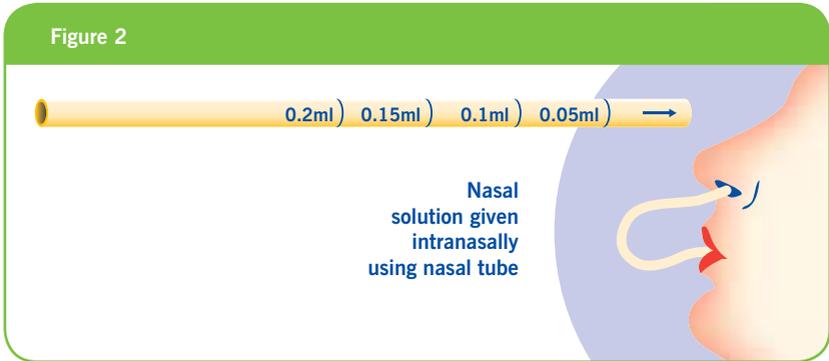
## How is Diabetes Insipidus Treated?

Diabetes insipidus is treated by replacing the missing hormone, vasopressin, with a synthetic form of the natural hormone. The synthetic hormone may also be an ‘analogue’ of the natural hormone called DDAVP. This means it has had a slight chemical change made to it, allowing it to have the same actions as the natural hormone but usually it lasts longer and so needs to be given less often. DDAVP can be given as tablets, nasal drops, nasal spray, injection and also as a wafer that goes under the tongue.

“Diabetes insipidus is treated by replacing the missing hormone, vasopressin, with a synthetic form of the natural hormone.”

Tablets take longer time to get into the blood and therefore have a slower effect in comparison to the nasal solution or injection. Injection into a vein or under the skin is used only for a short period of time i.e. after surgery.

In most patients oral tablets are the best way to take DDAVP. In young children requiring small doses of DDAVP, the tablets can be diluted in water and the smaller doses given as required, after instruction from the treating doctor. In situations when oral absorption of the drug may not be reliable or predictable (e.g. severe vomiting illness), nose drops containing DDAVP can be considered. Your doctor will advise you on the best way to take DDAVP.



Nasal solution is given intranasally using a special nasal tube as shown in figure 2.

If a person with diabetes insipidus had a cold or an allergy, the nose may become blocked. This may result in poor absorption of the administered vasopressin if it is given by nasal spray or solution drops and the dose may need to be given a second time. It is therefore important to try and clear the nose as much as possible before taking the treatment.

The synthetic hormone can be given once or twice a day. It is important to adjust the dose to cover daytime and night-time. The adjustment of the dose and type of treatment (tablets or nasal solution) may take some time and the doctor needs to check your child regularly and monitor his or her blood salt concentration (sodium). Young children and babies/infants may need only very small doses and more frequent follow up.



It is very important to have the dose of vasopressin regularly checked by the specialist, especially as repeatedly taking too much results in excess water absorption, which can be dangerous. In addition, it is important that the doses and timings of the treatment ensure that the individual's lifestyle is affected as little as possible. This may mean simply being able to sleep through the night without needing to get up to go to the toilet. Discussion with the doctor should also include advice as to what extra doses to take when the nose is blocked or the child is vomiting and absorption of treatment is less reliable.

If your child is unwell and/or with vomiting or diarrhoea, or your child is unable to take the vasopressin, you need to discuss with your doctor the need to adjust the vasopressin treatment and monitor your child's blood salt concentration (sodium). This is very important in children who don't have a sense of thirst as will be described in more detail later in this booklet.

## What Happens if There is No Sense of Thirst?

If the thirst centre has been affected, as can happen if there is damage to the hypothalamus, diabetes insipidus may be associated with the lack of a sense of thirst. This can occur particularly following surgery for a craniopharyngioma. Very occasionally, a lack of sense of thirst may occur on its own without diabetes insipidus.

It is very important to know whether a person has this condition. People who have no sense of thirst need to be encouraged to drink. The doctor will provide the individual or their family with an idea of how much fluid is needed each day – this may be called a fluid ‘prescription’. The amount of fluid needed will depend on the size of the person. In addition, it may have to be increased during hot weather and at the time of infection as at these times extra fluid is lost through sweating. For older people with diabetes insipidus, extra exercise will also result in increased fluid loss and they will need to increase their fluid intake to prevent this.

Generally, the fluid prescription can be managed quite easily by the affected individual or their carers, but these individuals need to have regular blood tests (sodium) to make sure they are not losing too much fluid.

Frequent consultation between the endocrinologist and those managing the affected person, such as parents or carers, is important. This will help to establish a stable situation and ensure a high level of awareness of the need for caution when external conditions, such as the weather or a fever, change.



If the child has this combined problem following treatment of a craniopharyngioma, please read the section, 'After Effects of a Craniopharyngioma and/or its Treatment' in the *Hormones and Me* Craniopharyngioma booklet.

In all people with diabetes insipidus it is important that they drink enough water to keep up their fluid requirements

## Diabetes Insipidus in Small Babies

Diabetes insipidus in small babies leads to the loss of large amounts of urine and excessive thirst just as it does in older children, but it may be difficult for the parents to recognise this. This problem may result in poor weight gain which then improves when treatment is given. Occasionally infants with diabetes insipidus may appear to be hungry rather than thirsty. The parent may give excess amounts of milk rather than water. Presentation with weight gain rather than loss can occur. This type of problem is seen in the first year of life, usually related to a tumour.

Vasopressin treatment can be given either by oral tablets (dissolved in water and smaller doses given) or by nasal drops. As much smaller doses are required in infants you will need to be taught by your doctor how to administer the very small doses. If nasal drops are being used your doctor may ask the pharmacist to make up a more dilute solution of the medication so that the dose can be given more accurately and that the volume to be given is not too large. It may be difficult to use the small plastic tube (see *Figure 3*) provided with the vasopressin treatment in babies and it is often easier to use a 1ml syringe. The baby is laid on one side and the vasopressin is gently dropped onto the inside of the nose and the baby is left in that position for a few minutes. The baby is then turned onto the other side and the remainder of the dose is again dropped into the inside of the nose.

Figure 3





Measuring urine loss in small babies can be quite difficult. It can be done fairly accurately by weighing nappies but this can be impractical in the long-term. Once the dose of vasopressin treatment has been established, it is usually enough for the parents to check their baby's nappy at regular intervals so that they get a clear idea of when the nappies are fairly dry and when they are wet. In time, most parents can recognise if their baby is passing more or less urine than normal.

It is always advisable to treat babies with the lowest possible dose of vasopressin as it is very important to avoid any risk of fluid overload. This means that sometimes extra water needs to be offered to the baby to make sure he/she does not become dehydrated. For example, a breast feeding mother may offer her baby some water at the end of each feed. If the baby is thirsty they will take the extra water. In addition, if for any reason a baby needs to be fed through a nasogastric tube, it is very important to monitor fluid intake in order to prevent fluid overload.

The problems are much greater in babies who are lacking a sense of thirst and it is very important to establish that at a very early stage. These babies do not feel a need to drink and they will need to have a water prescription to make sure they get enough fluids each day. The risks of dehydration during very hot weather or illness are quite high in these and all small babies with diabetes insipidus. Illness where vomiting or diarrhoea develops will usually require a short stay in hospital.

“It is always advisable to treat babies with the lowest possible dose of vasopressin as it is very important to avoid any risk of fluid overload.”

## Questions and Answers

### **Is diabetes insipidus permanent?**

Yes, almost always. However, in rare cases, following operations at the base of the brain, temporary diabetes insipidus may develop.

### **Are any special precautions needed for travel?**

When travelling to a hot climate, extra fluid intake will be needed due to extra loss of fluid as sweat. The specialist will be able to offer advice, however, the normal dose of vasopressin will usually be sufficient. If in a hot climate, the nasal solution drops or spray need to be stored in a cool place, but not in direct contact with ice as they should not be frozen. If a cool bag is unavailable, try wrapping the bottle in wet paper and keeping it in a plastic bag.

### **Will any adverse effects occur if the nasal solution or spray is left out of the fridge?**

Nasal solution drops and spray need to be refrigerated. If they are left out for a long time they may become less effective and a larger dose of vasopressin would therefore be required to achieve the usual effect.

### **Are there any adverse affects of drinking alcohol?**

Normally, drinking alcohol reduces vasopressin secretion. In individuals with partial diabetes insipidus there may be the need for additional treatment. In patients who are deficient in their own vasopressin there will obviously be no interaction. However, drinking large quantities of fluid, even in the form of alcohol, after taking vasopressin could lead to the risk of water overload.

### **What happens if a person with diabetes insipidus does not feel thirsty?**

If a person has diabetes insipidus where they lack the sense of thirst, please read the section on page 21. However, if the person is unwell and



has difficulty taking fluids or solids then they should seek medical advice as temporary inpatient care in a hospital may be necessary. In addition, in very hot weather, heat stroke can lead to sleepiness and a reduced thirst. Particular precautions will therefore be needed.

### **Is it dangerous to take too much vasopressin treatment?**

Yes. This will cause the retention of too much fluid in the body and will result in an increase in weight, swelling or puffiness of the limbs, an increase in blood pressure and headaches. The increased fluid retention causes a lower concentration of salts in the blood (serum osmolarity). Hyponatraemia, or low blood sodium, may result in fits. This can be a serious condition and generally it is safer to give too little vasopressin than too much.

### **What happens if a dose (nasal solution or oral tablets) is missed, or the dose does not get absorbed?**

If this happens, the person with diabetes insipidus will start passing a lot of urine and become thirsty.

If the dose is missed you can take the missed dose but try to delay your next “usual” dose for an hour to get back to a convenient routine. If the diabetes insipidus is mild it may be easier to simply drink more until the next dose is due. There is no absolutely correct way to deal with this.

### **Should a person with diabetes insipidus carry notification about their condition?**

Yes. It very important that an older child or adolescent has an information necklace or bracelet of which there is a variety available from any pharmacy, e.g. medic alert, SOS, etc., to advise people of their condition in case of an accident.

### **What extra care will be needed if a child with diabetes insipidus develops diarrhoea and vomiting?**

In young children, diarrhoea and vomiting can very easily upset their fluid balance and this may require special precautions and, possibly, admission to hospital to make sure their fluid balance is adequately controlled. If there are any doubts with a young child, medical assistance should be sought immediately.

### **Will having a cold affect the treatment of a person with diabetes insipidus?**

It may do if you are using the nasal spray or solution. If only one nostril is blocked, the other one will be adequate for treatment. If, however, the person's nose is totally blocked, they may not absorb enough medicine and their doctor should be consulted.

### **Should the school teachers of a child with diabetes insipidus be told about their condition?**

Yes. Each teacher who sees the child needs to be informed and told that the child needs free access to both drinks and the toilet, even during examinations. Children with diabetes insipidus can not hold their urine for long when they want to go to the toilet. If teachers ask the child to wait for a convenient time, it can cause the child great discomfort as well as embarrassment if they wet themselves.



**If a person with diabetes insipidus is also deficient in other pituitary hormones (hypopituitary or multiple pituitary hormone deficient (MPHD)), can this affect their diabetes insipidus?**

Yes, a person's diabetes insipidus can be affected if they also have cortisol insufficiency or thyroid hormone deficiency. Cortisol and thyroid hormone are important in helping the kidneys excrete large volumes of fluid in the urine. Thus, when a person starts receiving cortisol replacement treatment, this may unmask the diabetes insipidus because the person starts excreting the large quantities of urine associated with this diagnosis.





## Glossary

### **Biosynthetic Hormone**

Manufactured hormones that are identical to or perform the same function as those made naturally by our bodies.

### **Computerised Tomography (CT Scan)**

A type of X-ray which shows a three dimensional view of the area being examined.

### **Cortisol**

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

### **Endocrine Gland**

A gland that makes hormones and release 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.

### **Growth Hormone**

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

### **Hormones**

Blood chemicals that stimulate growth and sexual development and help to regulate the body's metabolism. Normally the body carefully controls the release of hormones as too much or too little may disrupt the body's delicate balance. They are produced by endocrine glands and carry messages from one cell to another via the bloodstream.



### **Hypothalamus**

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

### **Idiopathic**

The term used to describe the situation when no reason can be found to explain the cause of a disease or disorder.

### **Magnetic Resonance Imaging (MRI Scan)**

A technique for obtaining high-resolution scans of the brain and other parts of the body using magnetic fields and radio waves. There is no exposure to X-rays and they can therefore be repeated in the same person many times.

### **Paediatric Endocrinologist**

A doctor who specialises in the disorders of endocrine glands 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.

### **Serum osmolarity**

A blood test that indicates the concentration of solid particles in the liquid part of the blood. People with diabetes insipidus can have high serum osmolarity when they are losing a lot of water in the urine.

## **Sodium**

A substance measured in the blood that indicates salt concentration. Blood sodium measurement helps your doctor adjust vasopressin treatment.

## **Urine osmolarity**

A urine test that indicates the concentration of solid particles in the urine. People with diabetes insipidus can have low serum osmolarity when they are losing a lot of water in the urine.



## Support organisations & further reading

### **Australian Pituitary Foundation Ltd**

PO Box 105 Kellyville NSW 2155

Ph: 1300 331 807

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

### **Australasian Paediatric Endocrine Group (APEG)**

[www.racp.edu.au/apeg](http://www.racp.edu.au/apeg)

### **Diabetes Insipidus Foundation (USA)**

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

### **The Endocrine Society**

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

### **The Hormone Foundation**

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

### **John Hopkins University (information on radiosurgery)**

[www.med.jhu.edu/radiosurgery](http://www.med.jhu.edu/radiosurgery)

### **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 Society for Endocrinology**

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



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### Speak to an appropriate healthcare professional

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Merck Serono Australia Pty Ltd  
ABN 72 006 900 830  
Unit 3-4, 25 Frenchs Forest Road East  
Frenchs Forest NSW 2086 AUSTRALIA  
MET-JUL-11-ANZ-04



# Hormones and Me

## Diabetes Insipidus

This booklet is valuable reading for anyone  
with Diabetes Insipidus.

It is also recommended reading for their family and friends.