

**BLOOD SCIENCES
DEPARTMENT OF CLINICAL BIOCHEMISTRY**

Title of Document: Water Deprivation Test in Adults

Q Pulse Reference N^o: BS/CB/DCB/EN/16

Authoriser: Sadie Redding

Version N^o: 5

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WATER DEPRIVATION TEST**Introduction**

Diabetes insipidus (DI) involves deficient production or lack of effective action of antidiuretic hormone (ADH or arginine vasopressin). ADH stimulates the kidney to conserve fluid. Deficient production of ADH or lack of effective action of ADH causes a high urine output, thirst, dehydration, and low blood pressure in advanced cases.

Disease of the hypothalamus/pituitary gland leading to a deficiency in ADH production is called cranial or central DI. Disease of the kidney leading to lack of response of the kidney to fluid conserving action of ADH is called nephrogenic DI.

The principle of the water deprivation test is to assess the ability of the patient to concentrate urine when fluids are withheld. Water deprivation should normally cause increased secretion of ADH, resulting in the production of small volumes of concentrated urine.

Initial tests

Polyuria should be confirmed by 24hour urine volume.

Rule out diabetes, UTI, hypercalcaemia, hypokalaemia, renal failure and thyrotoxicosis.

Morning urine osmolality >600mOsm/kg rules out DI and therefore a water deprivation test is not necessary.

Preparation

Please contact the Duty Biochemist at least 24 hours before the test (ext.48437)

Normal dinner and fluids are allowed the night before the test. No alcohol or caffeine.

7am light breakfast but NO fluids, tea, coffee or smoking.

Supervision is required throughout to assess compliance and safety.

Contraindications

Hypovolaemia or hypernatraemia

Procedure

Print out a worksheet and record results in the table (appendix 1).

Please clearly label all blood and urine samples; the TIME of collection is essential.

1. 8 am:

- a) Empty bladder, record the volume, and send urine osmolality
- b) Take a serum osmolality
- c) Record the patient's weight.

2. Then for the next 8 hours check: Urine osmolality and weight every hour

 Serum osmolality every 2 hours

N.B. Stop the test and call the endocrine SPR if the patient's weight decreases by more than 3% of body weight (or by 4kg) or the serum osmolality rises >300mOsm/kg.

3. If the urine osmolality at 4 p.m. remains <600mOsm/kg proceed with the desmopressin test.

- a) Desmopressin (DDAVP) 20mcg intranasally or 2 µg intramuscularly
- b) Can eat and drink freely
- c) Hourly urine volumes and osmolality until 8.30pm.

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Interpretation

Urine osmolality > 600mOsm/kg excludes diabetes insipidus. The test can then be stopped if this is achieved.

Urine osmolality < 400mOsm/kg and raised serum osmolality indicates an inability to concentrate urine and in the absence of renal tubular disease this indicates diabetes insipidus.

In primary polydipsia the urine is usually adequately concentrated (osmolality >600mOsm/kg) and serum osmolality rises only slightly during water deprivation. However following prolonged primary polydipsia there may be a "washout effect" with a loss of solute from the renal medulla and consequent impairment of concentrating ability (i.e. due to reduced osmolality in the renal medulla and not related to ADH). This may result in a delayed response i.e. a rise in urine osmolality to above 400mOsm/kg but less than 600mOsm/kg within 8 hours of fluid deprivation.

The volume of urine passed may give confirmatory information. In normal subjects and primary polydipsia the urine output should decrease during water deprivation, while in diabetes insipidus relatively large volumes of dilute urine are passed in spite of rising plasma osmolality.

If the serum osmolality drops during the test (and/or the weight increases) it is very likely that the patient has consumed water during the test.

Post DDAVP

In cranial diabetes insipidus the urine osmolality should rise to above 600mOsm/kg, although lesser responses are occasionally seen in partial defects.

In nephrogenic diabetes insipidus the urine usually fails to concentrate to 600mOsm/kg. If there is still doubt please discuss interpretation and possible further investigations with Duty Biochemist.

Typical values

	Polydypsia	Cranial DI	Nephrogenic DI
Serum Osmolality mOsm/Kg	<295	>300	>300
Urine Osmolality mOSm/Kg	>600 (400-600 if chronic)	<300 Often <200	<300
Post DDAVP Urine Osmolality mOSm/kg	No response Or Mild response	>400-600	No response

References

1. Biochemical Investigations in laboratory medicine. Barth JE, Butler GE, Hammond P. ACB Venture Publications, London. 2001.
2. Hammersmith Endobible
3. Clinical Biochemistry and Metabolic medicine. Martin Crook.

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Appendix 1

Water Deprivation Test – Table of results

TIME	WEIGHT (Kg)	URINE VOLUME (ml)	SERUM OSMOLALITY	URINE OSMOLALITY
08:00				
09:00				
10:00				
11:00				
12:00				
13:00				
14:00				
15:00				
16:00				

If urine osmolality at 4 pm < 600mOsm/kg, give 20 µg of desmopressin (DDAVP) intranasally

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Desmopressin Test

TIME	WEIGHT (Kg)	URINE VOLUME (ml)	SERUM OSMOLALITY	URINE OSMOLALITY
17:30				
18:30				
19:30				
20:30				