BC Children's Hospital™

An agency of the
Provincial Health Services Authority

MEDICAL INVESTIGATION FACILITY
ENDOCRINOLOGY & DIABETES UNIT

http://endodiab.bcchildrens.ca

ENDOCRINE TEST PROTOCOLS

ACTH STIMULATION TEST

PURPOSE: The rapid ACTH stimulation test measures the adrenal response to ACTH and is used to diagnose primary and secondary adrenal insufficiency and defects of adrenal hormone synthesis. It may be combined with GnRH, TRH, and GH testing.

PREPARATION: Patient does not need to be fasting. No recent (48 h) steroid treatment or recently administered (within 24 h) radioisotope scan.

PROCEDURE: Start intravenous 0.9% saline at rate to maintain cannula patency, maximum 30 mL/h. May give maximum two 10 mL/kg boluses of 0.9% saline over 20 min PRN for poor blood return or hypotension. Use #22 or #24 Jelco with T-piece extension set.

DOSAGE: ACTH (cosyntropin, Cortrosyn®, Amphastar) is supplied as ward stock. A doctor's written order for Cortrosyn® indicating route and dose is required. Cortrosyn® is given IV push by the nurse after IV of normal saline has been established. ACTH may also be administered IM if there is no venous access.

High-dose: 250 µg
Low-dose: 1 µg. See next page for preparation of 1 µg/mL dilution.

SPECIMEN:

TIME	AMOUNT	TEST
0 min	1 mL red top	cortisol
*20 min	"	"
*30 min	"	"
*60 min	"	"

For the high-dose ACTH test, blood is generally obtained at 0 and 60 min; for the low-dose test, blood is generally obtained at 0, 20 and 30 min. At time test is booked, determine if additional blood is to be collected for each sample and if ACTH is to be collected on baseline sample. Physician will write request for tests other than cortisol.

BLOOD SAMPLES: as ordered:

ACTH: 2 mL purple top on ice, deliver ASAP
17-OHP: 2 mL red top
androstenedione: 2 mL red top
11-deoxycortisol: 2 mL red top
17-OH-pregnenolone: 2 mL red top

*Physician must specify which samples are to be collected.

COSYNTROPIN 1 µg/mL INJECTION

PURPOSE: Used for the low-dose ACTH stimulation test.

EQUIPMENT: 1 x ACTH (cosyntropin, Cortrosyn®, Amphastar) 250-µg vial
4 x 1-mL syringes
1 x 5-mL syringe
1 x 10-mL empty sterile vial

PROCEDURE: The 1 µg/mL dilution should be prepared immediately before it is needed.

USING ASEPTIC TECHNIQUE:

1. Reconstitute cosyntropin 250-µg vial with 1 (one) mL normal saline (the diluent supplied). Yields a concentration of 250 µg/mL.

2. Withdraw 0.1 mL of cosyntropin 250 µg/mL into a 1-mL syringe. Then draw up 4.9 mL normal saline into a 5-mL syringe. Transfer contents of both syringes (total volume = 5 mL) into an empty sterile 10-mL vial. Mix well. Yields a concentration of 5 µg/mL. Label *as cosyntropin 5 µg/mL*. Must be used within 8 hours.

3. Immediately before use: withdraw 0.2 mL of cosyntropin 5 µg/mL into a 1-mL syringe. Then draw up 0.8 mL normal saline into the syringe. Label *cosyntropin 1 µg/mL for test use*.

Prepared by BCCH Pharmacy Paul Koke / Bernadette Kondor, April 2004.

oCRH STIMULATION TEST

PURPOSE: The oCRH (ovine corticotropin-releasing hormone, corticorelin ovine triflutate, Achthrel®, Ferring, 100-µg vials, only available through Health Canada Special Access Program) stimulation test measures the pituitary response to oCRH and is used to diagnose Cushing syndrome. It is often performed 2 h after the end (i.e. at 0800 h) of a 48-h low-dose dexamethasone suppression test to rule out Cushing syndrome.

PREPARATION: Patient should be fasting. No recent recently administered (within 24 h) radioisotope scan.

PROCEDURE: Start intravenous 0.9% saline at rate to maintain cannula patency, maximum 30 mL/h. May give maximum two 10 mL/kg boluses of 0.9% saline over 20 min PRN for poor blood return or hypotension. Use #22 or #24 Jelco with T piece extension set.

DOSAGE: oCRH must be ordered by the physician from Ferring via the HPB Special Access Program. A doctor's written order for oCRH indicating route and dose is required. oCRH is given slow IV push (30 sec) by the ordering MD after IV of normal saline has been established. The dose is 1 µg/kg, maximum 100 µg.

SPECIMEN:

TIME	AMOUNT	TEST
–15 min	1 mL red top, 2 mL purple on ice	cortisol, ACTH
–10 min	"	"
–5 min	"	"
–1 min	"	"
+5 min	"	"
+15 min	"	"
+30 min	"	"
+45 min	"	"
+60 min	"	"

SIDE-EFFECTS: Transient flushing of the face and neck (16%), urge to take a deep breath (6%), and hypotension (lasting 30–60 min) have been noted.

GROWTH HORMONE STIMULATION TESTS

PURPOSE: Tests for growth hormone (GH) are classified into physiologic and pharmacologic. Physiologic testing includes sleep and exercise, during which GH secretion is enhanced. Pharmacologic stimulation is achieved by using arginine, glucagon and clonidine. All girls with bone age >8 years and boys with bone age >9 years up until Tanner 4 pubertal stage will be primed with micronized 17β-estradiol (Estrace®, 2 mg/day for body weight ≥20 kg, 1 mg/day for body weight <20 kg) for the two nights prior to testing. The physician will decide which tests will be performed. Only pharmacologic tests are currently used routinely. Any patient treated with GH should discontinue treatment for at least 2 weeks prior to retesting.

PREPARATION: 12-h fast (less for younger children or hypoglycemic patients). Consult physician with any specific concerns.

PROCEDURE: Start intravenous 0.9% saline at rate to maintain cannula patency, maximum 30 mL/h. May give maximum two 10 mL/kg boluses of 0.9% saline over 20 min PRN for poor blood return or hypotension. Use #22 or #24 Jelco with T piece extension set.

ARGININE

PURPOSE: Stimulates the release of growth hormone from the pituitary. May be performed simultaneously with TRH, GnRH, and ACTH test.

DOSAGE: L-arginine hydrochloride (Sandoz, comes as a 25% solution, 30-mL vials) 0.5 g/kg of body weight. Arginine must be diluted in a 1:3 or 1:2 dilution in normal saline and given by intravenous drip over a 30-min time period. Administer with caution to children with acidosis or hepatic or renal disease.

1:3 dilution for children <15 kg
1:2 dilution for children >15 kg

Maximum dose 22.5 g (90 mL before dilution).

IN CASE OF EXTRAVASATION, page the staff endocrinologist STAT. Order a 1500-unit vial of hyaluronidase to the MIF STAT. Initiate the C&W Policy & Procedure *Prevention and Management of Infiltration and Extravasation - Guidelines for Antidote Administration*.

SPECIMENS:

TIME	AMOUNT	TEST
0 min baseline*	1 mL red top	GH
30 min post-arginine	"	"
60 min post-arginine	"	"
90 min post-arginine	"	"

Each sample is monitored for glucose by meter.

GROWTH HORMONE STIMULATION TESTS *(continued)*

GLUCAGON

PURPOSE: May cause nausea, vomiting, and abdominal cramping. Also stimulates cortisol and insulin release. Not done concurrently with an ACTH stimulation test.

DOSAGE: Glucagon (Eli Lilly, 1-mg vial) is given IM
0.03 mg/kg, maximum 1 mg

SPECIMENS:

TIME	AMOUNT	TEST
0 min baseline*	1–2 mL red top	GH (and cortisol if ordered)
30 min post-glucagon	"	"
60 min post-glucagon	"	"
90 min post-glucagon	"	"
120 min post-glucagon	"	"
150 min post-glucagon	"	"
180 min post-glucagon	"	"

Each sample is monitored for glucose by meter.

CLONIDINE

PURPOSE: Commenced following 90-min arginine sample. May be done simultaneously with TRH, GnRH and ACTH.

DOSAGE Clonidine 0.15 mg/m^2 orally, maximum 0.25 mg
(comes as 0.025-mg and 0.1-mg tablets)

SPECIMENS:

TIME	AMOUNT	TEST
0 min baseline*	1 mL red top	GH
30 min post-clonidine	"	"
45 min post-clonidine	"	"
60 min post-clonidine	"	"
90 min post-clonidine	"	"
120 min post-clonidine	"	"

Each sample is monitored for glucose by meter.

SIDE-EFFECTS: Drowsiness is common following clonidine and many patients fall asleep. Blood pressure changes are usually found, with systolic blood pressure decreased 10–25 mm Hg and diastolic blood pressure decreased 5–15 mm Hg without symptoms. Monitor blood pressure @ 0, 30, 60, 90 and 120 min. Report significant changes to physician. Don't give to patients with history of heart disease/surgery.

GROWTH HORMONE STIMULATION TESTS *(continued)*

INSULIN

PURPOSE: Test will cause hypoglycemia for which the patient should be monitored. Classical symptoms include pallor, sweating, dizziness, hunger, fatigue. Test may be done simultaneously with TRH and GnRH tests.

DOSAGE: Administer Humulin Regular or Novolin Toronto insulin IV at 0.1 units/kg of body weight. Round up the dose to the nearest half-unit (use 30-U insulin syringes which are marked in half-units). For patients ≤30 kg, the insulin should be diluted 1:10 in normal saline to make dosing more accurate. The insulin will be diluted into a single syringe and injected into the cap of a T-piece close to the hub, with a 3-mL saline flush. The insulin is to be administered by a physician.

SPECIMENS:

TIME	AMOUNT	TEST
0 min baseline*	1 mL red top	GH
15 min post-insulin	"	"
30 min post-insulin	"	"
45 min post-insulin	"	"
60 min post-insulin	"	"
90 min post-insulin	"	"
120 min post-insulin	"	"

Each sample is monitored for glucose by meter.

PRECAUTIONS:

- The patient should be fasting.
- Two nurses and a physician must be present during the test.
- The insulin tolerance test (ITT) should not be done in subjects with a history of a seizure disorder or heart disease.
- IV access should be of good quality as IV administration of glucose may be necessary in case of severe hypoglycemia.
- Monitor patient throughout test (glucometer) at all time points. A 50% decrease in blood glucose compared to baseline is expected. In case of blood glucose ≤2.5 mmol/L, the patient should be given a snack (juice + cheese and crackers). Continue to collect blood samples as per protocol.
- A bag of D10/W should be available at bedside. D50/W is also always available in the crash carts. In case of severe hypoglycemia (loss of consciousness, seizure, inability to drink or eat), give D10/W 2 mL/kg (maximum 200 mL). Continue to collect blood samples as per protocol.
- At the completion of the test, discontinue the IV and feed patient.
- The patient may be discharged one hour after eating.

TRH STIMULATION TEST

PURPOSE: To assess the functional integrity of the hypothalamic—pituitary—thyroid axis. May be done simultaneously with arginine, GnRH, ACTH and OGTT tests.

PREPARATION: Fasting not required if performed alone. Check if other testing ordered that requires fasting.

PROCEDURE: Start intravenous 0.9% saline at rate to maintain cannula patency, maximum 30 mL/h. May give maximum two 10 mL/kg boluses of 0.9% saline over 20 min PRN for poor blood return or hypotension. Use #22 or #24 Jelco with T piece extension set.

DOSAGE: 200 µg TRH (protirelin, TRH-Thyrel®, Ferring, 200-µg vials, only available through Health Canada Special Access Program) given IV by nurse over 90 sec (diluted 1:1 with NS).

SPECIMENS:

TIME	AMOUNT	TEST
0 min	1 mL red top	TSH
	1 mL red top each	fT4, TPO-Ab, T3, prolactin if ordered
20 min	1 mL red top	TSH
40 min	"	"
60 min	"	"

PRECAUTIONS: Symptoms of nausea, vomiting, facial flushing, heart palpitations, urge to urinate and nasal itching may occur, but last only 30 sec.

May cause increased or decreased blood pressure, so use with caution in patients with hypertension and/or cardiovascular disease.

GnRH STIMULATION TEST

PURPOSE: To test the gonadotropin secretory response of the pituitary. It may be helpful in differentiating causes of delayed puberty as well as between secondary and tertiary disease and permanent/transitory disease in precocious puberty. May be done simultaneously with GH studies, TRH, ACTH or OGTT.

PREPARATION: Fasting is not required if performed alone. Check if other testing ordered that requires fasting. Estradiol and testosterone levels cannot be performed if the patient has had a recent radioisotope scan.

PROCEDURE: Start intravenous 0.9% saline at rate to maintain cannula patency, maximum 30 mL/h. May give maximum two 10 mL/kg boluses of 0.9% saline over 20 min PRN for poor blood return or hypotension. Use #22 or #24 Jelco with T piece extension set.

DOSAGE: GnRH (gonadorelin acetate, Relisorm®, EMD Serono, or Lutrepulse®, Ferring Inc.) 100 µg given IV by nurse.

SPECIMENS:

TIME	AMOUNT	TEST
0 min	3 mL red top	LH, FSH, estradiol/testosterone
	1 mL red top	DHEAS if ordered
20 min	2 mL red top	LH, FSH
30 min	"	"
*40 min	"	"

*May be extended to 4 h at physician's request.

60 min	2 mL red top	LH, FSH
240 min	3 mL red top	LH, FSH, estradiol/testosterone

GLUCOSE TOLERANCE TEST FOR DIABETES — ORAL

PURPOSE: A diagnostic test used in the assessment of disorders in blood sugar control. May be done with TRH and GnRH, but not with an ACTH stimulation test. See also growth hormone suppression test below.

PREPARATION: Fast 12 h. Water only to drink. When there is known or suspected hypoglycemia or in infants, the fast may be of shorter duration. Check physician's order for glucose dose and length of test. Patient should have a normal carbohydrate intake 3 days prior to testing and not experienced any recent illness. C-peptide levels cannot be performed if the patient has had a recent radioisotope scan. If ordered with an ACTH stimulation test, do OGTT first.

PROCEDURE: Start intravenous 0.9% saline at rate to maintain cannula patency, maximum 30 mL/h. May give maximum two 10 mL/kg boluses of 0.9% saline over 20 min PRN for poor blood return or hypotension. Use #22 or #24 Jelco with T piece extension set.

DOSAGE: Glucose drink is supplied by laboratory and dose is calculated and administered by testing room nurse.

1.75 g/kg body weight, maximum 75 g glucose. Must write dose and weight on lab requisition.

Drink must be consumed within 10 min.

SPECIMENS:

TIME	AMOUNT	TEST
0 min	0.5 mL green top BD	glucose
	glucose by meter	
	1 mL red top on ice, deliver ASAP	C-peptide if ordered
	1 mL red top	insulin if ordered
120 min	same as 0 minutes	

Do not need to send separate requisition with 120-min sample, just addressograph note.

*Call physician with glucose results from meter and determine if test is to be discontinued or prolonged.

INTERPRETATION: normal: FBG <6.1 AND 2-h BG <7.8
diabetes: FBG ≥7.0 OR 2-h ≥11.1 OR random BG ≥11.1
impaired glucose tolerance: 7.8 ≤ 2-h BG < 11.1
impaired fasting glucose: 6.1 ≤ FBG < 7.0

GLUCOSE TOLERANCE TEST — IV

PURPOSE: A diagnostic test used in the assessment of carbohydrate disorders.

PREPARATION: 12-h fast — less depending on age. C-peptide levels cannot be performed if the patient has had a recent radioisotope scan

PROCEDURE: Start intravenous 0.9% saline at rate to maintain cannula patency, maximum 30 mL/h. May give maximum two 10 mL/kg boluses of 0.9% saline over 20 min PRN for poor blood return or hypotension. Use #22 or #24 Jelco with T piece extension set.

DOSAGE: 0.5 g/kg body weight; not to exceed 35 g in total. Administer as a 25% solution (25 g glucose = 50 mL of 50% dextrose; dilute required amount of 50% dextrose 1:1 with normal saline to give a 25% solution), prepared by testing room nurse. The dose should be administered over an exact 3-min period. Timing is from end of infusion.

SPECIMENS:

TIME	AMOUNT	TEST
–10 min	1 mL red top on ice, deliver ASAP 1 mL red top 0.5 mL green top BD on ice glucose by meter each sample	C-peptide if ordered insulin if ordered glucose
–5 min	"	"
0 min	"	"
1 min	"	"
3 min	"	"
5 min	"	"
7 min	"	"
10 min	"	"

PROLONGED FAST FOR EVALUATION OF HYPOGLYCEMIA

PURPOSE: To determine the effect of fasting on serum blood sugar levels as well as tests glucoregulatory factors.

PREPARATION: Fast duration as ordered by doctor.

Note: The fast will begin at a time that will avoid having an anticipated low blood glucose during evening and/or night-time hours.

PROCEDURE: Start intravenous 0.9% saline at rate to maintain cannula patency, maximum 30 mL/h. May give maximum two 10 mL/kg boluses of 0.9% saline over 20 min PRN for poor blood return or hypotension. Use #22 or #24 Jelco with T-piece extension set.

Have 10% dextrose on hand. Give 2 cc/kg IV push, maximum 20 grams (200 cc), for serious hypoglycemia (patient unconscious, seizing or unable to consume oral carbohydrates). Notify physician on call.

Continue fast. Maximum duration 8–12 h for babies, 24–48 h for kids, 48–72 h for adolescents; **give *ad lib* water**

Draw baseline labs as ordered. Check **all** urines for ketones: be wary if still negative after 18–24 h

Blood glucose q 60 min if blood glucose >4 mmol/L, q 30 min if glucose 3–4, q 15 min if glucose <3, and STAT if symptomatic. Call physician for further orders when glucose reaches level as written in orders; confirm with STAT lab glucose.

Draw end-of-fast/hypoglycemic labs as ordered if patient reaches blood glucose or time criteria as spelled out in order sheet (usually ≤2.8 mmol/L)

If glucagon test is ordered, see glucagon stimulation test for hypoglycemia.

Ensure patient eats and has a normal blood glucose prior to discharge.

REFERENCE: Thornton PS, Stanley CA, De Leon, DD, et. al. Recommendations from the Pediatric Endocrine Society for evaluation and management of persistent hypoglycemia in neonates, infants, and children. *J Pediatr* 2015;167(2):238–245.

PROLONGED FAST FOR EVALUATION OF HYPOGLYCEMIA *(continued)*

SPECIMENS:

SAMPLE	AMOUNT	LAB
glucose	0.5 mL green BD*	STAT Lab
insulin	1 mL red top	Endocrine
cortisol	1 mL red top	"
GH	1 mL red top	"
lactate	1 mL grey top*+	STAT Lab
amino acids	2 mL green top (lithium heparin only)*	BGL
β-OH-butyrate	2 mL green top*	Chemistry
uric acid	1 mL red top	"
pyruvate	2 × 1 mL special tube on ice*	BGL^
ACTH	2 mL purple top on ice*	Endocrine
acylcarnitines	blood dot card and 1 mL serum	BGL
free fatty acids	2 mL red top	BGL^

*Many tubes require pre-chilling or other special handling. Contact Endocrine Lab at local 7446 or Biochemical Genetics Lab at local 2307.
^Preapproval from Biochemical Genetics Lab is required, call local 2307.
+No tourniquet!

urine ketones	2 mL in urine tube	Chemistry
urine organic acids	10 mL fresh voided urine	BGL

PRECAUTION: BE VERY CAREFUL IN PATIENTS WITH HISTORY OF HYPOGLYCEMIC SEIZURES!

GLUCAGON STIMULATION TEST FOR HYPOGLYCEMIA

PURPOSE: The test is used in the assessment of some hypoglycemic disorders to determine ability to release stored glycogen.

PREPARATION: 12-h fast, which may vary depending on patients' ability to fast.

PROCEDURE: Start intravenous 0.9% saline at rate to maintain cannula patency, maximum 30 mL/h. May give maximum two 10 mL/kg boluses of 0.9% saline over 20 min PRN for poor blood return or hypotension. Use #22 or #24 Jelco with T piece extension set.

DOSAGE: Glucagon (Eli Lilly, 1-mg vial) 0.03 mg/kg (maximum 1 mg) given IM/SQ
Note: Glucagon may be given IV, but must be ordered specifically. It is given slowly over 2 min. Nausea, vomiting and hypokalemia may be experienced.

SPECIMENS:

TIME	AMOUNT	TEST
0 min	0.5 mL green BD	glucose
5 min	"	"
10 min	"	"
15 min	"	"
20 min	"	"

GROWTH HORMONE SUPPRESSION TEST

PURPOSE: A diagnostic test used in the assessment of over-secretion of GH.

PREPARATION: Fast 12 h. Water only to drink.

PROCEDURE: Start intravenous 0.9% saline at rate to maintain cannula patency, maximum 30 mL/h. May give maximum two 10 mL/kg boluses of 0.9% saline over 20 min PRN for poor blood return or hypotension. Use #22 or #24 Jelco with T piece extension set.

DOSAGE: Glucose drink is supplied by laboratory and dose is calculated and administered by testing room nurse.

2.35 g/kg body weight, maximum 100 g glucose.
Drink must be consumed within 10 min.

SPECIMENS:

TIME	AMOUNT	TEST
0 min	2 mL red top	IGF-1 if ordered
	1 mL red top	GH
	meter glucose (not lab)	
30 min	"	"
60 min	"	"
90 min	"	"
120 min	"	"

INTERPRETATION: *J Clin Endocrinol Metab* 2007;92(12):4623–4629

CALCIUM—PENTAGASTRIN STIMULATION TEST

PURPOSE: Calcitonin is a biochemical marker for C-cell hyperplasia and medullary carcinoma of the thyroid. Stimulation tests are helpful to detect this disorder early and to identify affected family members.

PREPARATION: Tests performed after a 12-h fast. May have water only to drink.

PROCEDURE: Start intravenous 0.9% saline at rate to maintain cannula patency, maximum 30 mL/h. May give maximum two 10 mL/kg boluses of 0.9% saline over 20 min PRN for poor blood return or hypotension. Use #22 or #24 Jelco with T piece extension set. Check doctor's orders for drug orders including amount and route of administration.

NOTE: *CARDIAC MONITOR TO BE USED ON PATIENT DURING INITIATION OF TEST. THE CALCIUM IS ADMINISTERED FIRST, FOLLOWED BY PENTAGASTRIN.

DOSAGES:

1. **Calcium** 0.2 mL/kg (2 mg/kg of elemental calcium) of **10% calcium gluconate.** Maximum dose: 0.2 mL/kg (2 mg/kg of elemental calcium) for weights <100 kg, **or** 20 mL of calcium gluconate for weights >100 kg. NOTE: 10% calcium gluconate = 9 mg/mL elemental calcium.

2. **Pentagastrin** (Pentavlon®, Wyeth-Ayerst) 0.5 µg/kg (no maximum dose) **CURRENTLY UNAVAILABLE**

Because of the low dose of pentagastrin used, 1 mL of pentagastrin (2 mL vial = 250 µg/mL) is injected into 9 mL NS to give a concentration of 25 µg/mL. An appropriate dose of 0.02 mL/kg can then be given.

Calcium and pentagastrin are given by the endocrinologist only. Calcium gluconate is given slowly over 50–60 seconds, followed immediately by pentagastrin, which is given over 5–10 seconds. **Timing in this test is crucial!**

Use timer for counting. Calcitonin levels peak at 2–3 min following completion of the pentagastrin dose. Counting must be accurately timed both for the administration of drugs and the time elapsed from completion of drug administration and blood specimens obtained.

SPECIMENS:

TIME	AMOUNT	TEST
0 min	2–3 mL red top on ice, deliver ASAP	calcitonin
2 min	"	"
3 min	"	"
5 min	"	"
10 min	"	"

CALCIUM—PENTAGASTRIN INFUSION TEST *(continued)*

Specimens are **not** to be left at room temperature. Notify lab that specimens are being drawn. They must be kept cold. The lab must spin them immediately and freeze for assay.

SIDE EFFECTS: Pentagastrin side effects may be mild and transient lasting only 1–2 min. They include flushing, headache, abdominal pain, dizziness and drowsiness. Others have had more stressful responses and have described it as a "panic attack" with shortness of breath, sweating and feeling of heaviness.

Calcium side effects may include possible cardiac arrhythmia if pushed IV too quickly. Have cardiac monitor on patient while physician is giving IV push.

WATER DEPRIVATION TEST

PURPOSE: To determine an individual's ability to concentrate urine. The primary indication for this test is to diagnose or rule out central or nephrogenic diabetes insipidus.

PREPARATION:

1) In consultation with physician, determine the start time of fluid deprivation; usually, this is at bedtime the night before testing.
2) Determine if additional testing and/or blood work is to be collected.
3) Determine limits for terminating testing or for when physician needs to be notified, e.g. urine SG ≥1.020, serum sodium ≥150 mmol/L, weight loss ≥5% of morning weight.
4) Inquire if test dose of DDAVP is to be given; obtain exact dosage and instructions for rehydration. Order DDAVP from Pharmacy if necessary.
5) May be done simultaneously with ACTH, TRH, GnRH and glucagon stimulation testing, using minimal flush. Do arginine stimulation after water deprivation test is finished.

PROCEDURE:

1) On admission to MIF:
   — obtain and record weight, TPR, and BP
   — obtain urine specimen and send 2-mL aliquot for SG and osmolality; record amount and SG
   — establish IV access for blood sampling using #24/22 Jelco with T-piece extension set; saline lock for future use
   — draw baseline labs as ordered
2) Obtain and record q1–2 h:
   — urine collection for volume and SG; send 2-mL aliquot for lab analysis (osmolality and SG)
   — blood specimen for sodium and osmolality.
   — Note: attempt to obtain blood and urine specimens at same time.
3) Weight and vital signs q1–2 h:
   — when end points for blood and/or urine are obtained, contact physician and obtain further orders
   — collect blood sample for ADH (4-mL pre-chilled purple top (full!), deliver to lab ASAP); mark "SAVE" on requisition; must be collected prior to DDAVP
   — give prescribed DDAVP dose, if requested
   — if DDAVP is given, a urine specimen must be collected prior to patient discharge for SG and osmolality
4) 1230 h: if patient has not achieved end points for terminating testing, call physician and determine if the hypertonic saline infusion test is to be commenced. If so, an order will be required.

HYPERTONIC SALINE INFUSION TEST

PURPOSE: If the patient's serum osmolality or Na^+ does not increase sufficiently (>300 mmol/kg or >145 mmol/L, respectively) during the water-deprivation test, the physician may elect to perform the hypertonic saline infusion test.

PROCEDURE: Start second IV line. 3% hypertonic saline solution (500 mmol/L) is infused IV at a rate of **0.1 mL/kg/min**, to achieve an osmolality of ≥295 mmol/kg or Na^+ 145–150 mmol/L. Maximum time of infusion 2 h or until patient becomes symptomatic.

BLOOD: Collect Na^+ and osmolality q 20 min from **first** IV line throughout test. Monitor urine and weight as with water-deprivation test. When desired levels of osmolality and Na^+ are achieved: draw sample for Na^+, osmolality and, if desired, ADH (vasopressin) level (2 × 5-mL pre-chilled green tops on ice to Endocrine Lab).

INTERPRETATION: Simultaneous plasma osmolality and vasopressin levels can be plotted on a standard nomogram to distinguish among complete and partial central DI, nephrogenic DI, primary polydipsia and normal.

PRECAUTIONS: Do not perform in the face of congestive heart failure, adrenal insufficiency, or hypothyroidism.

SIDE EFFECTS: Headache, nausea, hypo- and hypertension and intense thirst.

REFERENCE: Vokes TJ and Robertson GL. Disorders of Antidiuretic Hormone. *Endocrinology and Metabolism Clinics of North America* 17:281–299, 1988.

APPENDIX

Sample order sheets for these are online:

- Endocrine Tests:
  - www.bcchildrens.ca/endocrinology-diabetes-site/documents/endoorders.pdf
- Prolonged Fast:
  - www.bcchildrens.ca/endocrinology-diabetes-site/documents/fastorders.pdf
- Water Deprivation Test:
  - www.bcchildrens.ca/endocrinology-diabetes-site/documents/wdeporders.pdf