Biochemistry testing in Psychiatry

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The right test for the right reason

Biochemistry testing in Psychiatry

- Learning objectives:

1. which biochemistry tests can help identify underlying medical conditions
2. limitations of tests used for DOA screens
3. which biochemistry test can help identify possible side effects of drugs used to treat psychiatric disorders

Biochemistry testing in Psychiatry

- When is a problem psychiatric?
- Medical disorders that present with psychiatric symptoms
- Common medications causing psychiatric syndromes

When is a problem psychiatric?

- Psychiatrists are often asked to assess patients presenting with disturbances of affect, behaviour and cognition or common presenting psychiatric symptoms that include:

  delirium, dementia, psychosis, mania, anxiety.

When is a problem psychiatric?

- Prevalence of comorbid physical illness investigated in psychiatric settings(4-18%).
- All patients presenting with new psychiatric illness need medical assessment.

When is a problem psychiatric?

- Evaluation as recommended in some textbooks:

  Na, glucose, urea, calcium, magnesium, prescription drug levels, urine drug screen, TSH, vitamin B_{12}.

  Other tests may be indicated depending on history and physical.

Medical Assessment

- Conclusion of one article: Routine laboratory testing to evaluate for medical illness in psychiatric patients in the emergency department is largely unrevealing. (West J Emerg Med 2009)

Medical Assessment

- reviewed the value of routine laboratory studies performed on 375 patients in order to exclude concomitant medical illness.

- " patients presenting to the ED with psychiatric chief complaints, benign histories and normal physical exams have a low likelihood of clinically significant laboratory findings."

Medical Assessment

- Should there be routine testing to evaluate for medical illness in psychiatric patients?

  NO!!!!!

Do not forget history and physical exam!!!!!

Medical assessment and laboratory testing

Medical Assessment

- Potential medical illnesses causing psychiatric syndromes:

  <u>neurologic causes</u>

  stroke, epilepsy, MS, head trauma, Parkinson's disease, neoplasms

  <u>vitamin deficiencies</u>

  thiamine, folate, vitamin B12

Medical Assessment

Metabolic abnormalities

hyponatremia, hypokalemia, hypocalcemia, hypercalcemia, hypomagnesemia, hypermagnesemia, hypoglycemia, acidosis, hyperosmolar state

Medical Assessment

Endocrine abnormalities

hypothyroidism, hyperthyroidism, hypoparathyroidism, hyperparathyroidism, Diabetes Mellitus, hypoadrenalism, hyperadrenalism

Infectious diseases

sepsis, meningitis, encephalitis, brain abscess, neurosyphilis, AIDS

Laboratory testing

- **vitamin deficiencies**

  Folate and vitamin B12 levels are tests available in all hospital laboratories.

  Others ,such as thiamine, are performed only in certain specialized laboratories and as such will have very long turn around times, e.g. over 2 months.

Out of province Laboratory testing

- The Ministère de la santé et des services sociaux has decreed that, as of December 1st 2011, any physician requesting laboratory tests done outside the province of Québec must follow certain instructions.
- The requesting physician must fill in an «Autorisation pour des services de biologie médicale non disponibles au Québec » form (AH-612).

Laboratory testing

- Metabolic conditions:

  Hyponatremia: consider SIADH, diuretics, vomiting, diarrhea.

Work up of hyponatremia

What to order?

serum osmolality

random urine osmolality

random urine sodium

Diagnostic tests

How do we interpret the results?

Urine osmolality must always be interpreted with serum osmolality.

Is there a normal urine osmolality?

Diagnostic tests

No!!!!!

Urine osmolality reflects water intake and ADH secretion in order to maintain serum osmolality.

Always compare serum and urine osmolality.

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à suivre - continued

BIOCHIMIE / BIOCHEMISTRY

ANALYSE(S) TEST(S)	RESULTAT(S) RESULT(S)	ALARMES FLAG(S)	UNITES UNITS	VAL.DE REF. REF.RANGE	T.M. M.T.
BIOCHIMIE GÉNÉRALE /GENERAL BIOCHEMISTRY					
SPECIMEN GLD COLLECTED 09/08/04 BY RECEIVED 09/08/04 08:50 BY ROB					
SODIUM	**125**	**L**	mmol/L	133-146	Remis
POTASSIUM	4.8		mmol/L	3.5-5.1	Remis
CHLORURES/CHLORIDE	**95**	**L**	mmol/L	97-110	Remis
GLUCOSE AC	**10.1**	**H**	mmol/L	3.0-6.0	Remis
URÉE/UREA	1.9		mmol/L	1.7-8.9	Remis
CRÉATININE	50		umol/L	44-123	Remis
BILIRUBINE TOTALE	14.4		umol/L	3.6-25.2	Remis
TRIGLYCÉRIDES	1.05		mmol/L	0.40-1.80	Remis
CHOLESTEROL	3.6		mmol/L	2.8-5.2	Remis
HDL CHOLESTEROL	**0.61**	**L**	mmol/L	0.90-2.00	Remis
LDL CHOLESTEROL	2.51		mmol/L	0.00-3.40	Remis
TC/HDL-C RATIO	5.9		mmol/L		Remis

PRENEZ NOTE DES CHANGEMENTS SUIVANTS ÉFFECTIFS DEPUIS 01/01/2009
TAKE NOTE OF THE FOLLOWING CHANGES EFFECTIVE AS OF 01/01/2009
(REF:CAN J CARDIO 2006)
RISK CATEGORIES AND TREATMENT RECOMMENDATIONS
CATÉGORIES DE RISQUES ET OBJECTIFS DE TRAITEMENT

	% Risque de MCAS	LDL-C	TC/HDL-C Ratio
Élevé/High	>= 20 %	< 2.0	< 4.0
Moderate	11-19 %	< 3.5	< 5.0
Bas/Low	<= 10 %	< 5.0	< 6.0

ALKALINE PHOSPHATASE	106		IU/L	13-113	Remis

suite à la prochaine page - continued on next page

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B I O C H I M I E / B I O C H E M I S T R Y

ANALYSE(S) TEST(S)	RESULTAT(S) RESULT(S)	ALARMES FLAG(S)	UNITES UNITS	VAL.DE REF. REF.RANGE	T.M. M.T.
INDICES SÉRIQUES / SERUM INDICES					
SPECIMEN GLD COLLECTED 09/08/06 BY RECEIVED 09/08/06 08:44 BY ROB					
HÉMOLYSE / HEMOLYSIS	0			0-2	Remis
ICTERE / ICTERUS	1			0-2	Remis
LIPÉMIE / LIPEMIA	0			0-2	Remis
BIOCHIMIE GÉNÉRALE /GENERAL BIOCHEMISTRY					
SPECIMEN GLD COLLECTED 09/08/06 BY RECEIVED 09/08/06 08:44 BY ROB					
SODIUM	**126**	**L**	mmol/L	133-146	Remis
POTASSIUM	4.7		mmol/L	3.5-5.1	Remis
CHLORURES/CHLORIDE	97		mmol/L	97-110	Remis
OSMOLALITÉ / OSMOLALITY					
SPECIMEN GBM COLLECTED 09/08/06 BY RECEIVED 09/08/06 08:44 BY ROB					
SERUM MEASURED	**268**	**L**	mmol/kg	280-300	SK
URINE MEASURED	566		mmol/kg		SK
CHIMIE URINAIRE (MICTION) / URINE RANDOM					
SPECIMEN YCP COLLECTED 09/08/06 BY RECEIVED 09/08/06 13:28 BY SL					
SODIUM	SEE BELOW		mmol/L	NONE	SL
no urine received					

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B I O C H I M I E / B I O C H E M I S T R Y

ANALYSE(S) TEST(S)	RESULTAT(S) RESULT(S)	ALARMES FLAG(S)	UNITES UNITS	VAL.DE REF. REF.RANGE	T.M. M.T.
CHIMIE URINAIRE (MICTION) / URINE RANDOM					
SPECIMEN YCP COLLECTED 09/08/07 BY RECEIVED 09/08/07 09:15 BY ROB					
SODIUM	79		mmol/L	NONE	Remis

Laboratory testing

- **Metabolic conditions**

  hypocalcemia:

  remember the most common cause of hypocalcemia or low total calcium is hypoalbuminemia.

  Always order albumin levels at the same time. A corrected calcium may then be calculated.

Laboratory testing

- **Metabolic conditions**

  hypercalcemia:

  first rule out parathyroid adenoma in outpatients so order parathyroid hormone and phophorus. These are available routinely.

  classic picture or parathyroid adenoma: ⇑ Ca,⇓PO4, ⇑PTH.

Laboratory testing

- **Metabolic conditions**

  hypercalcemia:

  first rule out malignancy in hospitalized patients who usually would have clinically obvious disease. Order PTH and phosphorus.

Laboratory testing

- **Metabolic conditions**:

  hypomagnesemia: causes include decreased intestinal absorption, increased tubular excretion due to chronic alcoholism and certain drugs. Should also order calcium and potassium levels as they can be affected by hypomagnesemia.

Laboratory testing

- **<u>Endocrine conditions</u>**:

  thyroid dysfunction.

  Thyroid abnormalities can induce mood, anxiety, psychotic, and cognitive disorders. Thus, thyroid function tests are routinely checked in psychiatric patients.

  However, up to 30% of psychiatric patients may demonstrate thyroid function test abnormalities that do not reflect true thyroid disease.

Laboratory testing

This is likely a manifestation of secondary effects on one or more levels of the hypothalamic-pituitary-thyroid (HPT) axis. Originally termed the euthyroid sick syndrome, this phenomenon is now more commonly referred to as “non-thyroidal illness.”

Laboratory testing

- In psychiatric patients with non-thyroidal illness, patterns of thyroid function test abnormalities may vary considerably based upon factors such as the underlying psychiatric disorder, the presence of substance abuse, or even the use of certain psychiatric medications.

Laboratory testing

- Patterns may include:

  Normal TSH and ⇑ Free T4 as in psychosis

  slightly ⇑ or ⇓ TSH and ⇑ free T4 as in depression.

Laboratory testing

- Given the fact that thyroid function test abnormalities seen in non-thyroidal illness usually resolve spontaneously, treatment is generally unnecessary, and may even be potentially harmful.

Laboratory testing

- Unless there is clinical evidence of thyroid disease, routine screening with thyroid function testing is generally unhelpful. In the psychiatric population, only a minority of abnormal thyroid laboratory tests are clinically significant, and few of these findings will lead to actual changes in clinical management.

Laboratory testing

- Endocrine disorders:

  hyperarenalism order free urine cortisol as a screening test.

  hypoadrenalism order serum morning cortisol and ACTH as a secondary test.

Table 2. MOST COMMON MEDICATIONS CAUSING PSYCHIATRIC SYNDROMES (PARTIAL LISTING)

	Delirium	Psychosis	Mania	Depression	Anxiety
Medications					
Antiarrythmics					
Amiodarone	X	X			
Disopyramide		X		X	X
Lidocaine		X		X	X
Procainamide	X	X		X	X
Quinidine	X				
Tocainide	X				
Antibiotics					
Aminoglycosides	X				
Chloramphenicol	X			X	
Clofazimine	X				
Cycloserine	X	X		X	
Isoniazid	X*	X		X	X
Penicillins	X*				
Sulfonamides	X*				
Quinolones	X				X
Trimethoprim		X		X	
Antifungals					
Amphotericin B	X*				
Fluconazole	X*				
Ketoconazole	X			X	
Antivirals					
Acyclovir	X	X		X	
Didanosine	X*				
Ganciclovir	X*				X
Antiasthmatics (sympathomimetics)	X				
Anticholinergics	X	X			
Benzodiazepines	X			X	
Barbiturates	X			X	
β-blockers		X		X	
Cimetidine	X				
Decongestants (stimulants)	X		X		X
Digitalis	X	X		X	
Glucocorticoids	X	X	X	X	X
L-dopa	X	X		X	
Meperidine	X	X		X	X
Methyldopa		X		X	
Drugs of abuse					
Amphetamines	X	X	X		X
Cocaine	X	X	X		X
Hallucinogens	X	X			X
Inhaled drugs	X	X			X
Phencyclidine	X	X			X
Withdrawal syndromes					
Alcohol	X	X	X	X	X
Amphetamines	X		X	X	X
Barbiturates	X	X		X	X
Benzodiazepines	X	X		X	X
Cocaine	X	X	X	X	X

Testing for drugs of abuse

Drugs of abuse

- Prevalence of Substance abuse:

  one study ⇒ 218/266 patients in a PES testing + for:

  cocaine 26 %

  sedative hypnotics 7%

  cannabinoids 4%

  opiates 3%

  amphetamines 1%

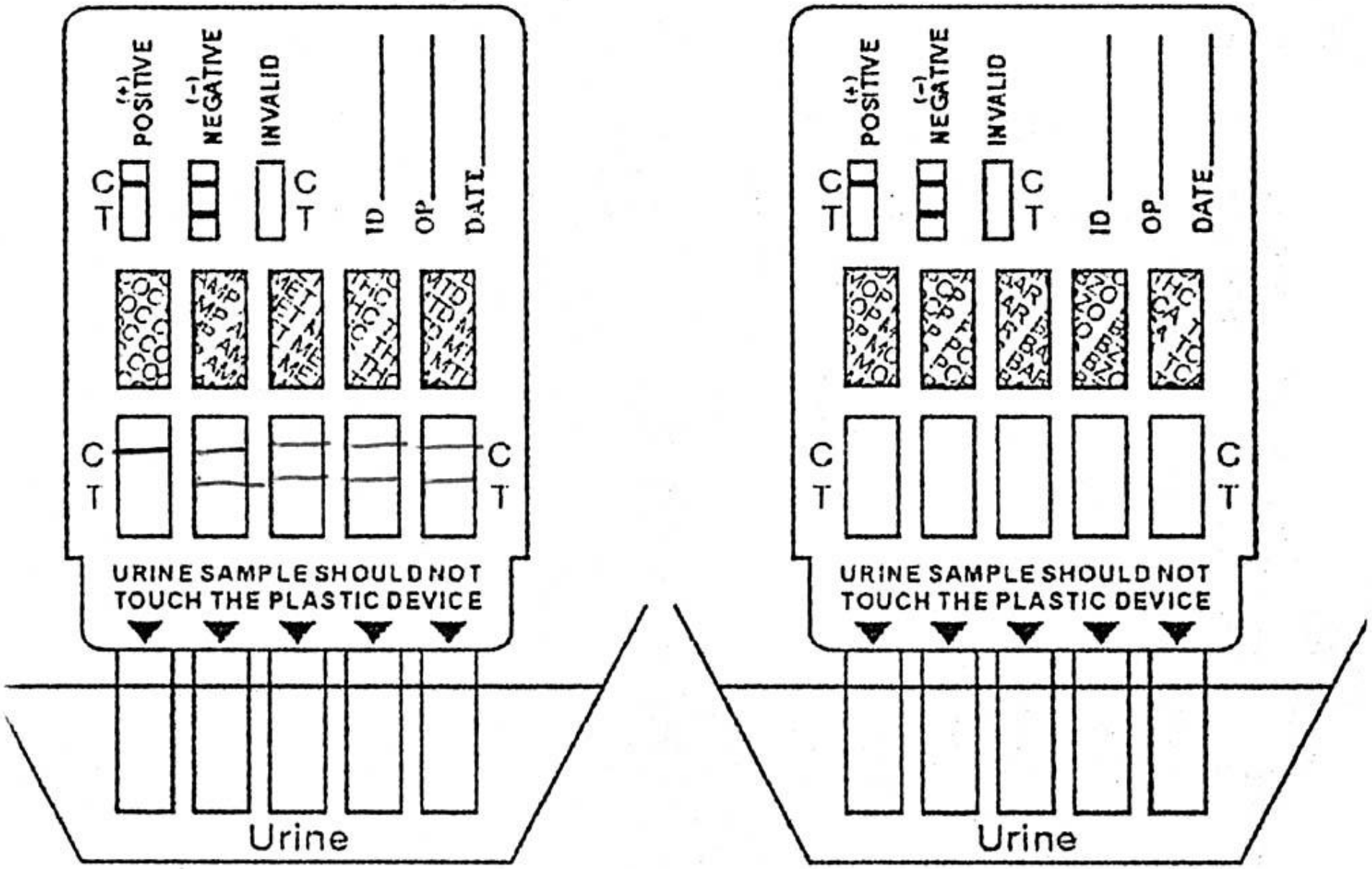
Drugs of abuse

- In the laboratory we test for:

amphetamines, cocaine, PCP, cannabinoids/THC, opiates.

Analytical issues

- Specificity
- Sensitivity
- Interfering substances


(+) POSITIVE
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URINE SAMPLE SHOULD NOT
TOUCH THE PLASTIC DEVICE
Urine

Analytical issues

- ***LISTING OF CROSS-REACTING SUBSTANCES***

  When immunoassays are used, the laboratory should list the major cross-reacting substances for each drug class when a positive result is reported

A study was conducted to determine the cross-reactivity of the test with compounds in either drug-free urine or Amphetamine, Cocaine, Morphine, Phencyclidine, or Marijuana positive urine. The following compounds show no cross-reactivity when tested with the One Step Multi-Drug Screen Test Panel (Urine) at a concentration of 100 µg/mL.

Non Cross-Reacting Compounds

Acetaminophen
Acetophenetidin
N-Acetylprocainamide
Acetylsalicylic acid
Aminopyrine
Amitryptyline
Amoxicillin
Ampicillin
L-Ascorbic acid
Apomorphine
Aspartame
Atropine
Benzilic acid
Benzoic acid
Benzphetamine
Bilirubin
(±) - Brompheniramine
Caffeine
Cannabidiol
Chloralhydrate
Chloramphenicol
Chlorothiazide
(±) - Chlorpheniramine
Chlorpromazine
Chlorquine
Cholesterol
Clomipramine
Clonidine
Cortisone
(-) Cotinine
Creatinine
Deoxycorticosterone
Dextrohorphan
Diclofenac
Diflunisal
Digoxin
Diphenhydramine
Ecgonine hylester
(-) -Ψ-Ephedrine
[1R,2S] (-) Ephedrine
(L) - Epinephrine
Erythromycin
β-Estradiol
Estrone-3-sulfate
Ethyl-p-aminobenzoate
Fenoprofen
Furosemide
Gentisic acid
Hemoglobin
Hydralazine
Hydrochlorothiazide
Hydrocortisone
O-Hydroxy-hippuric acid
p-Hydroxy-amphetamine
3-Hydroxytyramine
Ibuprofen
Imipramine
Iproniazid
(±) - Isoproterenol
Isoxsuprine
Ketamine
Ketoprofen
Labetalol
Loperamide
Maprotiline
MDE
Meperidine
Meprobamate
Nalidixic acid
Naloxone
Naltrexone
Naproxen
Niacinamide
Nifedipine
Norethindrone
D-Norpropoxyphene
Noscapine
DL-Octopamine
Oxalic acid
Oxolinic acid
Oxyazoline
Papaverine
Penicillin-G
Pentazocine hydrochloride
Perphenazine
Phenelzine
Trans-2-phenylcyclo-propylamine hydrochloride
L-Phenylephrine
β-Phenylethylamine
Phenylpropanolamine
Prednisolone
Prednisone
Promazine
Prohazine
DL-Propranolol
D-Propoxyphene
D-Pseudoephedrine
Quinacrine
Quinidine
Quinine
Ranitidine
Salicylic acid
Serotonin
Sulfahazine
Sulindac
Tetracycline
Tetrahydrocortisone 3-acetate
Tetrahydrocortisone 3-(β-D-glucuronide)
Tetrahydrozoline
Thiamine
Thioridazine
DL-Tyrosine
Tolbutamide
Triamterene
Trifluoperazine
Trihoprim
Trimipramine
Tryptamine
DL-Tryptophan
Tyramine
Uric acid
Verapamil
Zomepirac

BIBLIOGRAPHY

1. Stewart DJ, T Inoba, M Ducassen, W Kalow. *Clin. Pharmacol. Ther.* 1979; 25:264

Analytical issues

- ***IMMUNOASSAY CUT-OFF:***

  Qualitative assays for drugs of abuse testing require cut-off concentrations to distinguish between**+** and**-** results.

Analytical Specificity

The following tables lists the concentration of compounds (ng/mL) that are detected positive in urine by the One Step Multi-Drug Screen Test Panel (Urine) at 5 minutes.

Amphetamine

D-Amphetamine	1,000
D,L-Amphetamine sulfate	3,000
L-Amphetamine	50,000
(±) 3,4-hylenedioxyamphetamine	2,000
Phentermine	3,000

Cocaine

Benzoylecgonine	300
Cocaine HCl	780
Cocaethylene	12,500
Ecgonine HCl	32,000

Morphine

Codeine	300
Ethylmorphine	5,000
Hydrocodone	12,500
Hydromorphone	5,000
Levophanol	75,000
6-Monoacetylmorphine	1,000
Morphine	300
Morphine 3-β-D-glucuronide	300
Norcodeine	12,500
Normorphone	50,000
Oxycodone	25,000
Oxymorphone	25,000
Procaine	150,000
Thebaine	100,000

Phencyclidine

4-Hydroxyphencyclidine	12,500
Phencyclidine	25

THC

Cannabinol	20,000
11-nor-Δ^9-THC-9 COOH	30
11-nor-Δ^8-THC-9 COOH	50
Δ^8-THC	15,000
Δ^9-THC	15,000

Immunoassay cut-offs

- To reduce the number of false-positive results, the cut-off is set at a concentration that is higher than the assay limit of detection.
- Negative does not mean absent.
- Cut-off concentrations optimized for work place testing are not necessarily appropriate for clinical toxicology.

Immunoassay cut-offs

- The substance abuse and Mental Health Services administration recently raised the opiate cut-off from 300-2000/ug/L to reduce the number of opiate-positive results attributable to poppy seed consumption.
- Cocaine $\geq$ 300 ug/L for workplace but cardiac toxicity can occur at 100 ug/L

TABLE 27-8 | U.S. Government Drug Detection Cut-off Concentrations

Drug or Drug Class	Immunoassay (ng/mL)		GC/MS (ng/mL)	
	HHS/DOT	DOD	HHS/DOT	DOD
Amphetamines	1000			
Amphetamine		500	500	500
Methamphetamine		500	500[1]	500[1]
Barbiturates		200		
Amobarbital				200
Butalbital				200
Pentobarbital				200
Secobarbital				200
Cannabinoids	50	50		
THC-COOH			15	15
Cocaine metabolites	300	150		
Benzoylecgonine			150	100
LSD		0.5		0.2
Opiates	2000[3]	300[2]		
Morphine			2000[3]	4000
Codeine			2000[3]	2000
6-Acetylmorphine			10	10
PCP	25	25	25	25

Abbreviations: HHS, Department of Health and Human Services; DOT, Department of Transportation; DOD, Department of Defense; PCP, phencyclidine; LSD, lysergic acid diethylamide; THC-COOH, 11-nor-Δ^9-tetrahydrocannabinol-9-carboxylic acid.

[1] Also requires presence of amphetamine (≥200 ng/mL).

[2] 25 ng/mL if assay specific for free morphine.

[3] Screening and confirmatory values recently changed (effective May 1998) from 300 to 2000 ng/mL.

(Data from Fed. Reg., *53:*11963, 1988; Fed. Reg., *59:*29908–29981, 1994; *62:* 51118–51120, 1997; Irving, J.: Drug testing in the military: Technical and legal problems. Clin. Chem., *34:*637–640, 1988; Liu, R.H.: Evaluation of common immunoassay kits for effective workplace drug testing. *In:* Handbook of Workplace Drug Testing. R.H. Liu, B.A. Goldberger, Eds. Washington, DC, AACC Press, 1995, p. 70.)

Duration of detectability in urine summary

- PCP < 8days
- Sedatives hypnotics 1-3 days
- Opioids 1-3 days
- Amphetamines < 2 days
- Cocaine < 48 hours for infrequent user, up to 10-22 days for frequent users.
- THC/cannibinoids: infrequent smokers 2-5 days, habitual users 3-4 weeks.

Metabolic side effects of psychiatric medication

Antipsychotic medications

- Medications such as thioridazine and clozapine:

  Non-neurological side effects:

  weight gain, dyslipidemia, hyperglycemia and diabetes mellitus.

Antipsychotic medications

- Order:

  fasting glucose, triglycerides, total, LDL and HDL cholesterol

- Consensus conference recommends laboratory testing at 12 months and then annually for glucose, every 5 years for lipid levels presuming no other reason for more frequent monitoring.

Anitidepressant medications

- Some antidepressants are associated with significant weight gain e.g: Mirtazipine, TCAs.
- Monitor for metabolic complications.
- Order glucose and lipid profile as a baseline and then at 12 weeks.

Mood stabilizers

- Lithium side effects:

  tubular renal function (expressed as urinary concentrating ability) can be reduced.

  may increase the incidence of end-stage renal failure.

Mood stabilizers

- Lithium can cause goiter, hypothyroidism, chronic autoimmune thyroiditis, and possibly hyperthyroidism.
- Lithium may also cause hypercalcemia, elevated serum parathyroid hormone, and hyperparathyroidism.

Mood stabilizers

- ***Urinalysis, BUN, and creatinine every 2 to 3 months during the first 6 months of therapy, and every 6 to 12 months thereafter.***
- ***Thyroid function tests once or twice during the first 6 months, and every 6 to 12 months thereafter or more frequently in higher risk patients.***
- ***Serum calcium is monitored yearly***

Drugs of abuse

- Alcohol: Never assume that loss of consciousness in alcoholic patient is simply caused by intoxication.
- Duration of detectability: 24 hours

Drugs of abuse

- Cocaine and amphetamines:

  intoxication- anxiety, paranoia, tremor, mydriasis, tachycardia, diaphoresis, hypertension, hyperthermia, **psychosis**, transient signs of delirium, mimic bipolar disorders.

  cocaine⇒ angina, MIs, rhabdomyolisis, "crash"(dysphoria)

Drugs of abuse

- Cocaine:

  Primary psychotic disorders and substance induced psychosis cause by cocaine are difficult to distinguish.

  Behavior can resemble "high and lows" of bipolar mood swings.

  Duration of detectability: 2 days

Drugs of abuse

- Beware of combination alcohol +cocaine⇒ neurotoxicity, cardiotoxicity, homocidal ideation.

  amphetamines⇒ stimulant effects, sexual enhancing effects, sympathomimetic effects, paranoid psychosis. During withdrawal ⇒ severe dysphoria, irritability.

Drugs of abuse

- Amphetamines:

  Are stimulants that produce sympathomimetic effects in addition to euphoria and weight loss.

  duration of detectability: <2 days

Drugs of abuse

- Opioids:

  acute intoxication/overdose-miosis, respiratory depression.

  withdrawal-e.g. can begin 4-6 hours after heroin abstinence. Elevated pulse, blood pressure, irritability, dysphoria and anxiety.

  duration of detectability: < 2-5 days

Drugs of abuse

- Sedative- hypnotics:

  withdrawal syndromes- if mild to moderate⇒ vital sign elevation

  - if severe⇒vital sign instability, hyperpyrexia, restlessness, agitation, tremor, psychosis, delusions, hallucinations, delirium.

duration of detectability: 1-3 days

Drugs of abuse

- PCP:

  has a wide variety of potential clinical effects, some of which are unpredictable but are generally dose related.

  Nystagmus, hypertension,agitation, tachycardia

- Nystagmus, hypertension, alert and oriented, violent, agitated, tachycardia.

Drugs of abuse

- PCP

  depending on the dose:

  disorientation, depersonalization, dissociative thought, euphoria, mania and marked dysphoria hallucinations.

  Duration of detectability: 8 days

Diagnostic criteria for diabetes Mellitus

Diagnostic criteria for diabetes Mellitus

- FPG ≥7.0 mmol/L (Fasting = no caloric intake for at least 8 hours) or

- Casual PG ≥11.1 mmol/L + symptoms of diabetes (Casual = any time of the day, without regard to the interval since the last meal) (Classic symptoms of diabetes = polyuria, polydipsia and unexplained weight loss) or

diagnostic criteria for diabetes Mellitus

- 2hPG in a 75-g OGTT ≥11.1 mmol/L

  (A confirmatory laboratory glucose test (an FPG, casual PG,or a 2hPG in a 75-g OGTT) must be done in all cases on another day in the absence of unequivocal hyperglycemia accompanied by acute metabolic decompensation

Annex
2009 Canadian cholesterol guidelines

SUPPLEMENTARY INFORMATION

SUPPLEMENTARY TABLE 1
Stakeholders in the elaboration of the Canadian lipid guidelines

- Canadian Cardiovascular Harmonization of National Guidelines Endeavor (C-Change). Putting Prevention into Practice
- Canadian Association of Cardiac Rehabilitation
- Canadian Cardiovascular Society
- Canadian College of Family Physicians of Canada
- Canadian Council for Tobacco Control
- Canadian Council of Cardiovascular Nurses
- Canadian Diabetes Association
- Canadian Hypertension Society
- Canadian Medical Association
- Canadian Obesity Network
- Canadian Pharmacists Association
- Canadian Society for Exercise Physiology
- Canadian Stroke Network
- Canadian Working Group on Dyslipidemias
- Obesity Canada
- Public Health Agency of Canada
- Royal College of Physicians and Surgeons of Canada
- Canadian Institutes of Health Research

SUPPLEMENTARY TABLE 2
Criteria used for evaluation of evidence

Recommendation grade

Class I
- Evidence and/or general agreement that a given diagnostic procedure/treatment is beneficial, useful and effective

Class II
- Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the treatment
  - Class IIa Weight of evidence in favour
  - Class IIb Usefulness/efficacy less well established

Class III
- Evidence that the treatment is not useful and in some cases may be harmful

Level of evidence

Level A
- Data derived from multiple randomized clinical trials or meta-analysis

Level B
- Data derived from a single randomized clinical trial or large nonrandomized studies

Level C
- Consensus of opinion by experts and/or small studies, retrospective studies and registries

SUPPLEMENTARY TABLE 3
Major changes since the 2006 recommendations

- Involvement of the Canadian Vascular Coalition and the Canadian Institutes of Health Research
- Secondary and high-risk prevention
  - Strategy better defined
  - Clinical studies on end-stage disease (advanced heart failure and hemodialysis)
- Primary prevention
  - Cardiovascular risk evaluation tools
  - Framingham risk score includes cardiovascular diseases
  - Intermediate risk defined as a Framingham risk score of 10% to 19% for 10-year risk
  - Family history part of risk stratification
  - High-sensitivity C-reactive protein part of risk stratification in intermediate-risk subjects whose low-density lipoprotein cholesterol level does not already suggest treatment (men older than 50 years and women older than 60 years of age)
- Targets
  - Simplified target levels
  - Apolipoprotein B role defined
  - Secondary targets evaluated according to available evidence

SUPPLEMENTARY TABLE 4A
Estimation of 10-year risk of total cardiovascular disease in men (Framingham Heart Study)

POINTS	Age	HDL-C	Total Cholesterol	SBP Not Treated	SBP Treated	Smoker	Diabetic	
−2		>1.6		<120				
−1		1.3-1.6						
0	30-34	1.2-1.3	<4.1	120-128	<120	NO	NO	
1		0.9-1.2	4.1-5.2	130-139				
2	35-39	<0.9	5.2-6.2	140-159	120-129			
3			6.2-7.2	160+	130-139		YES	
4			>7.2		140-159	YES		
5	40-44				160+			
6								
7	45-49							
8	50-54							
9								
10	55-59							
11	60-64							
12								
13	65-69							
14	70-74							
15	75+							TOTAL POINTS
Points Allotted								

Adapted from reference 33. HDL-C High-density lipoprotein cholesterol; SBP Systolic blood pressure

SUPPLEMENTARY TABLE 4B
Cardiovascular disease risk for men

Points	Risk, %	Points	Risk, %	Points	Risk, %
−3 or less	<1	5	3.9	13	15.6
−2	1.1	6	4.7	14	18.4
−1	1.4	7	5.6	15	21.6
0	1.6	8	6.7	16	25.3
1	1.9	9	7.9	17	29.4
2	2.3	10	9.4	18+	>30
3	2.8	11	11.2		
4	3.3	12	13.3		

SUPPLEMENTARY TABLE 5A
Estimation of 10-year risk of total cardiovascular disease in women (Framingham Heart Study)

POINTS	Age	HDL-C mmol/L	Total Cholesterol	SBP Not Treated	SBP Treated	Smoker	Diabetic	
−3				<120				
−2		>1.6						
−1		1.3-1.6			<120			
0	30-34	1.2-1.3	<4.1	120-129		NO	NO	
1		0.9-1.2	4.1-5.2	130-139				
2	35-39	<0.9		140-149	120-129			
3			5.2-6.2		130-139	YES		
4	40-44		6.2-7.2	150-159			YES	
5	45-49		>7.2	>160	140-149			
6					150-159			
7	50-54				160+			
8	55-59							
9	60-64							
10	65-69							
11	70-74							
12	75+							TOTAL POINTS
Points Allotted								

Adapted from reference 33. HDL-C High-density lipoprotein cholesterol; SBP Systolic blood pressure

2009 Canadian cholesterol guidelines

- **Target lipid levels**

  Risk level : High

  patients with CAD, PVD, atherosclerosis,*Most patients with diabetes, FRS ≥20%RRS ≥20%

  Initiate treatment if: Consider treatment in all patients

2009 Canadian cholesterol guidelines

- **Primary targets:**

  LDL-C <2 mmol/L or ≥50% ↓ LDL-C

  or apoB <0.80 g/L

PATIENT PRIVE / PRIVATE (WC)
No Req./Order#: G6150337
Méd.Req./Req.Dr.:
SCHWEITZER MORRIS
Copie à/Copy to:
SCHWEITZER MORRIS
3755 Cote Ste-Catherine
E-104
Montréal, QC, H3T1E2

B I O C H I M I E / B I O C H E M I S T R Y

ANALYSE(S) / TEST(S)	RESULTAT(S) / RESULT(S)	ALARMES / FLAG(S)	UNITES / UNITS	VAL.DE REF. / REF.RANGE	T.M. / M.T.
BIOCHIMIE GÉNÉRALE /GENERAL BIOCHEMISTRY					
SPECIMEN GLD COLLECTED 10/10/15 09:05 BY M_JG RECEIVED 10/10/15 14:04 BY ROB					
HÉMOLYSE / HEMOLYSIS	0			0-2	Remis
ICTERE / ICTERUS	1			0-2	Remis
LIPÉMIE / LIPEMIA	0			0-2	Remis
SODIUM	134		mmol/L	133-146	Remis
POTASSIUM	4.9		mmol/L	3.5-5.1	Remis
GLUCOSE FASTING/A JEUN	**8.6**	**H**	mmol/L	3.3-5.6	Remis
***CRITERE DIAGNOSTIQUE DU DIABETE/					
***DIAGNOSTIC CUTOFF DIABETES:	>=7.0 mmol/ L				
CRÉATININE	88		umol/L	44-123	Remis
BILIRUBINE TOTALE	7.8		umol/L	3.6-25.2	Remis
TRIGLYCÉRIDES	1.39		mmol/L	0.40-1.80	Remis
CHOLESTEROL	3.4		mmol/L	2.8-5.2	Remis
HDL CHOLESTEROL	**0.80**	**L**	mmol/L	0.90-2.00	Remis
LDL CHOLESTEROL	1.96		mmol/L	0.00-3.40	Remis
TC/HDL-C RATIO	4.3		mmol/L		Remis

PRENEZ NOTE DES CHANGEMENTS SUIVANTS ÉFFECTIFS DEPUIS 01/01/2009
TAKE NOTE OF THE FOLLOWING CHANGES EFFECTIVE AS OF 01/01/2009
(REF:CAN J CARDIO 2006)
RISK CATEGORIES AND TREATMENT RECOMMENDATIONS
CATÉGORIES DE RISQUES ET OBJECTIFS DE TRAITEMENT

	% Risque de MCAS	LDL-C	TC/HDL-C Ratio
Élevé/High	>= 20 %	< 2.0	< 4.0
Moderate	11-19 %	< 3.5	< 5.0

Useful links

- 2009 Canadian Cardiovascular Society/Canadian guidelines.
- J Genest, R McPherson, J Frohlich, et al. 2009 CanadianCardiovascularSociety/Canadian guidelines for the diagnosis and treatment of dyslipidemia and prevention of cardiovascular disease in the adult – 2009 recommendations. **Can J Cardiol 2009;25(10):567-579.**

Useful links

- Canadian Journal of Diabetes

  September 2008 | Volume 32 | Supplement 1
- Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada

Useful links

- **Abnormal Thyroid Function Tests in Psychiatric Patients: A Red Herring?**
- **Anna L. Dickerman, M.D.; John W. Barnhill, M.D.**
- **From the Department of Psychiatry, Weill Cornell Medical College, New York.**

- ***Am J Psychiatry 2012;169:127-133.*** **10.1176/appi.ajp.2011.1104063**