Application of The Multiple Drugs Immunoassay Test For Rapid Detection of Drug Abuse in Postmortem Urine

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Objective: *The ADVANCED QUALITY™ One Step Multi-Drug Screen test is a new urine on-site immunoassay test that is designed to detect multiple drugs of abuse in one time (barbiturates, benzodiazepines, cocaine, methylenedioxymethamphetamine (MDMA), methamphetamine, and opiates group). Thus, the present research was done to evaluate the diagnostic performance of this test.*

Material and Method: *Urine samples obtained from corpses subjected to medicolegal autopsy at the forensic unit in Ramathibodi Hospital between October 2007 and March 2009 were used for the present study. The diagnostic performance of this immunoassay test was determined by using the results of the rapid emergency drug identification high sensitivity (REMEDi™ HS) system as the gold standard.*

Results: *Two hundred forty six urine samples were used in the present study. The sensitivity with their 95% confidence interval of cocaine, opiates, methamphetamine, and benzodiazepines assay was 100% (100-100%) each. The specificity with their 95% confidence interval of these was 100% (100-100%), 98% (96.75-99.94%), 95% (91.70-97.38%), and 93% (89.89-96.24%), respectively. The MDMA and barbiturates were not evaluated because there was no true positive result.*

Conclusion: *The ADVANCED QUALITY™ One Step Multi-Drug Screen test is reliable for drugs of abuse screening in postmortem urine.*

Keywords: *Drugs of abuse, Immunoassay test, REMEDI, Postmortem urine, Medico legal autopsy, Methamphetamine, Cocaine, Opiates, Barbiturates, MDMA, Benzodiazepines*

At present, drugs of abuse cause many problems in Thailand. They add costs to our societies in terms of lost productivity, transmission of infectious diseases, family and social disorder, crime, and excessive utilization of health care[1]. In 2006, a report showed that methamphetamine led the list of drugs of greatest concern. This was followed by cannabis, crystal methamphetamine, inhalants, cough syrups, ecstasy, ketamine, cocaine, benzodiazepines, barbiturates, and heroin[2].

Drugs of abuse-related death and complications are very likely to be a significant part of the medicolegal investigation of death[3]. A study in northern Thailand showed the incidence of benzodiazepines and methamphetamine in corpses with medicolegal investigation of death is 11.8% and 8.5%, respectively[4]. Therefore, it is necessary to examine drugs of abuse in every medicolegal investigations of death.

The most common specimens used for analysis of drugs of abuse in postmortem are blood, liver, and urine[5]. In urine, the accumulation of drugs and metabolites usually results in high concentrations. Therefore, urine has a great potential to provide information on antemortem drug exposure. However, there is no correlation between urine drug concentration and pharmacological effects[6]. It is frequently used in screening procedures, which is the most important part of the toxicological analysis, especially in death related to drugs of abuse and prescribed medication as well as in apparent accidental death where impairment is suspected[6,7]. Urine, unlike blood, is mostly free of proteins and lipids, and can be analyzed either directly by immunoassays or non-instrumental spot tests as well as after extraction with an appropriate solvent[6]. Many urine on-site immunoassay tests are used to

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screen for drugs of abuse and many previous studies that compared these tests with laboratory tests showed concordance results[8-13]. Furthermore, previous studies comparing detection of antemortem drugs of abuse showed concordance results[14,15]. In Thailand there are many commercial urine on-site immunoassay tests that are designed for single drug detection but a new device, the ADVANCED QUALITY™ One Step Multi-Drug Screen test, is an on-site test that can detect multiple drugs in one time.

This report compares this new device with the rapid emergency drug identification high sensitivity (REMEDi™ HS) system in detecting drugs of abuse from postmortem urine. This REMEDi™ HS system is routinely used in Ramathibodi Hospital for screening procedures. It is accepted for forensic application[16,17]. Furthermore, the authors can study the incidence of drugs of abuse in corpses with medicolegal investigation of death in Ramathibodi Hospital.

Material and Method
Sample materials

Urine samples, obtained from corpses subjected to medicolegal autopsy at the forensic unit in Ramathibodi Hospital between October 2007 and March 2009 were used for the present study. The urine samples from the corpses that had admission in the hospital before death or were injected with formalin were not used in the present research. Urine samples were collected by a needle attached to a syringe after the bladder was exposed in autopsy. In a case in which the bladder contained only a small amount of urine, the bladder was opened to collect the residual urine, but the minimum volumes were 5 ml. When a urine sample was collected, the ADVANCED QUALITY™ One Step Multi-Drug Screen test was performed within 30 minutes by the pathologist. Urine samples were sent to the toxicology unit in Ramathibodi Hospital for screening procedures by using the REMEDi™ HS system within 24 hours. These samples were kept in 4 degree Celsius refrigerator until testing.

ADVANCED QUALITY™ One Step Multi-Drug Screen test

The ADVANCED QUALITY™ One Step Multi-Drug Screen test is a rapid, qualitative, competitive immunoassay for determination of drugs of abuse and their metabolites in human urine. The device, which the present study used, composed of six chromatographic strips designed to detect barbiturates, benzodiazepines, cocaine, methylene-dioxymethamphetamine (MDMA), methamphetamine, and opiates (morphine) group. Each strip consists of a sample pad treated with antibody colloidal gold conjugate and membrane treated with drug conjugate and control reagent. Urine sample initially reacts with the antibody gold conjugate, and then migrates up the strip, by capillary action, to the test area. If sufficient drug is present in the urine, it binds with the conjugate, preventing it from binding to the drug conjugate immobilized on the test membrane in the test region. Any unbound conjugate continues to migrate up the strip to the control region where it binds to the control reagent producing a purple band. The control band indicates that the result is valid. A negative specimen produces two distinct color lines but a positive specimen produces only one color line, despite faint line, in the control area.

The compounds and cross-reactive compounds, detected by this assay, are listed in Table 1 with minimum levels of them that produce positive results. The cutoff values of this device correspond to the guidelines of the National Institute on Drug Abuse (NIDA).

The procedure begin with the immersion of the bottom end of the test strips into a urine sample. The urine samples must be more than 5 ml for immersion. The strip must be kept below the bottom of the plastic card or the maximum line marked on the strips. The strip is held in the urine sample until a reddish color appeared at the lower edge of the test membrane. The strip is then withdrawn from the urine sample and the results are read between 3-8 minutes.

This test provides only preliminary data and is not intended to monitor drug levels, which should be confirmed by other methods such as gas chromatography/mass spectrophotometry (GC/MS).

REMEDi™ HS system

The REMEDi™ HS system is a broad spectrum drug identification system that is using high performance liquid chromatography (HPLC) with on-line sample preparation and analysis. A multi-column approach was used to extract, purify, and analyze drugs in urine followed by multi-wavelength ultraviolet detection.

Statistical analysis

The diagnostic performance of the ADVANCED QUALITY™ One Step Multi-Drug Screen test was determined, using the results of the

Table 1. Compounds detected by the test

Names of group	Names of compound	Levels of reactivity
Barbiturates	Amobartital	300 ng/ml
	Alphenol	150 ng/ml
	Aprobarbital	37.5 ng/ml
	Barbital	300 ng/ml
	Butabarbital	300 ng/ml
	Butalbital	75 ng/ml
	Phenobarbital	300 ng/ml
	Phentobarbital	300 ng/ml
	Secobarbital	5 ng/ml
	5,5'-diphenylhydantoin	300 ng/ml
Benzodiazepines	Oxazepam	300 ng/ml
	Alphahydroxyalprazolam	300 ng/ml
	Alphahydroxyaltriazolam	300 ng/ml
	Alprazolam	100 ng/ml
	Bromazepam	400 ng/ml
	Clobazam	3,000 ng/ml
	Clonazepam	1,000 ng/ml
	Clorazepate	100 ng/ml
	Desmethyldiazepam	100 ng/ml
	Diazepam	100 ng/ml
	Flunitrazepam	400 ng/ml
	Flurazepam	150 ng/ml
	Lorazepam	300 ng/ml
	Lormetazepam	400 ng/ml
	Medazepam	1,500 ng/ml
	Nitrazepam	400 ng/ml
	Nordiazepam	300 ng/ml
	Prazepam	150 ng/ml
	Temazepam	300 ng/ml
	Triazolam	750 ng/ml
Cocaine	Benzoylecgonine	300 ng/ml
	Cocaine	15 µg/ml
	Ecgonine	100 µg/ml
	Tropacocaine	100 µg/ml
MDMA	Methylenedioxyamphetamine (MDA)	2,000 ng/ml
	MethylenedioxyethylMDMA (MDEA)	1,000 ng/ml
	L-MDMA	100 ng/ml
	d-MDMA	100 ng/ml
	L-methMDMA	100 ng/ml
	d-methMDMA	100 ng/ml
	HydroxymethMDMA (HAM)	100 ng/ml
	DihydroxymethMDMA (HMMA)	100 ng/ml
	N-methyl-1(1-3-benzodioxol-5-yl)-2-butanamine (MBDB)	100 ng/ml
Methamphetamine	(+) Methamphetamine	500 ng/ml
	(±) Methamphetamine	1.0 µg/ml
	(±) 3,4-Methylenedioxymethamphetamine	1.0 µg/ml
	(±) 3,4-Methylenedioxyamphetamine	10 µg/ml
	d-amphetamine	5 µg/ml
	d,l-amphetamine	10 µg/ml
	Ephedrine	25 µg/ml
	Pseudoephedrine	10 µg/ml
	Phenylpropanolamine (PPA)	50 µg/ml

Table 1. (Cont.)

Names of group	Names of compound	Levels of reactivity
Opiates	Morphine	300 ng/ml
	Morphine-3-d-glucuronide	300 ng/ml
	Hydromorphone	300 ng/ml
	Nalorphine	300 ng/ml
	Codeine	500 ng/ml
	Ethylmorphine	500 ng/ml
	Hydrocodone bitartrate	1,000 ng/ml
	Norcodeine	2,000 ng/ml
	Normorphine	3,700 ng/ml
	Oxycodone	2,500 ng/ml
	Heroin	4,000 ng/ml
	Naloxone	6,000 ng/ml
	Thebaine	5,000 ng/ml

REMEDi™ HS system as the gold standard. Collecting data for each sample were gender, age, race, and cause and manner of death of the corpse. The incidences of each drug of abuse from the results of the REMEDi™ HS system were collected too.

Statistical analysis was performed by using STATA software package version 10 (College Station, Tx., USA). Demographic data of age was expressed as mean with standard deviation. The other characteristic features were categorized into groups and presented as numbers or percentages. The diagnostic performance of the ADVANCED QUALITY™ One Step Multi-Drug Screen test was expressed as the sensitivity, specificity, positive predictive value, and negative predictive value with their 95% confidence intervals (95% CI).

Results
Demographic data

Two hundred forty six urine samples that had at least 5 ml in volume and did not meet exclusion criteria were collected from the corpses. Two hundred twenty two of the corpses were male (90.2%). Mean age was 39.36 ± 14.23 years (range was 15-86 years). Thai were found as the most races (85.8%). Causes of death in most of the corpses were traffic accident (16.7%), coronary atherosclerosis (13.8%), hanging (6.5%), falling from a height (5.7%), drowning (4.5%), pulmonary tuberculosis (2.8%), gunshot wound at the head (2.4%), and head injuries due to body assault (2.4%). Manners of death were natural (45.5%), accident (30.5%), suicide (11.4%), homicide (9.3%), and undetermined (3.3%). From using the results of the REMEDi™ HS system, methamphetamine was detected in eight urine samples (3.2%) and amphetamine was detected in four of these urine samples. Morphine was detected in four urine samples (1.6%) and monoacetyl morphine, probable heroin metabolite, was detected in two of these urine samples. Cocaine and its metabolites were detected in three urine samples (1.2%). Alprazolam was detected in only one urine sample (0.4%). One urine sample had two groups of drug abuse (cocaine and opiates). In conclusion, 15 of 246 (6%) of the urine samples had drugs of abuse. The causes of death in the corpses that had these urine samples were drug intoxication (5 of 15), sharp force injuries (3 of 15), gunshot wound at the head (2 of 15), traffic accident (2 of 15), hanging (1 of 15), falling from a height (1 of 15), and cholangiocarcinoma (1 of 15).

Interpretation

When the procedures as mentioned above were finished, all strips of all test devices produced one or two marked purple bands for easy interpretation. But MDMA and benzodiazepines strip of some devices slowly produced purple bands in test areas. These purple bands did not appear until 5 minutes. Comparing results of the test and the REMEDi™ HS system showed many false positive tests of MDMA and benzodiazepines assay. Then, since June 2008 (after 120 tests had been done), the results had been read between 5-8 minutes after withdrawing the devices from urine samples. However, none of these ADVANCED QUALITY™ One Step Multi-Drug Screen tests was invalidated by the nonappearance of the control band.

Cocaine assay

The ADVANCED QUALITY™ One Step Multi-Drug Screen test and the REMEDi™ HS system results were in all complete agreement (positive in 3 and negative in 243). There was no false positive or negative. The sensitivity, specificity, positive predictive value, and negative predictive value with their 95% CI were 100.00% (100.00-100.00%) each. At least 1.94 µg/ml of cocaine with no metabolite was detected in the positive samples (Table 2, 3: Cocaine).

Opiates assay

The ADVANCED QUALITY™ One Step Multi-Drug Screen test and the REMEDi™ HS system results of 242 urine samples were in agreement (positive in 4 and negative in 238). False positive results were found in four urine samples but there was no false negative result. The sensitivity, specificity, positive predictive value, and negative predictive value with their 95% CI were 100.00% (100.00-100.00%), 98.35% (96.75-99.94%), 50.00% (43.75-56.25%), and 100.00% (100.00-100.00%), respectively (Table 2, 3: Opiates). In four true positive urine samples; 2.24 µg/ml of morphine was detected in one, 0.26 µg/ml of morphine and 0.40 µg/ml of monoacetyl morphine in one, 0.31 µg/ml of morphine and 0.40 µg/ml of monoacetyl morphine in one, and one had over range of morphine or heroin. In four false positive urine samples, cocaine, and cocaine metabolite were detected in one, but in three of them the REMEDi™ HS system could not detect any drugs.

Methamphetamine assay

The ADVANCED QUALITY™ One Step Multi-Drug Screen test and the REMEDi™ HS system

Table 2. Comparative results between the ADVANCED QUALITY™ One Step Multi-Drug Screen test (on-site test) and the REMEDi™ HS system confirmation method

Assays	Urines (n = 246)	REMEDi +	REMEDi -
Cocaine	On-site test +	3	0
	On-site test -	0	243
Opiates	On-site test +	4	4
	On-site test -	0	238
Methamphetamine	On-site test +	8	13
	On-site test -	0	225
Benzodiazepines	On-site test +	1	17
	On-site test -	0	228
MDMA	On-site test +	0	15
	On-site test -	0	231
Barbiturates	On-site test +	0	1
	On-site test -	0	245

Table 3. The sensitivity (sens), specificity (spec), positive predictive value (PPV), and negative predictive value (NPV) with 95% confidence interval (95% CI) of each assay in the ADVANCED QUALITY™ One Step Multi-Drug Screen test (comparative with the REMEDi™ HS system confirmation method)

Assays	Sens (95% CI)	Spec (95% CI)	PPV (95% CI)	NPV (95% CI)
Cocaine	100.00% (100.00-100.00%)	100.00% (100.00-100.00%)	100.00% (100.00-100.00%)	100.00% (100.00-100.00%)
Opiates	100.00% (100.00-100.00%)	98.35% (96.75-99.94%)	50.00% (43.75-56.25%)	100.00% (100.00-100.00%)
Methamphetamine	100.00% (100.00-100.00%)	94.54% (91.70-97.38%)	38.10% (32.03-44.16%)	100.00% (100.00-100.00%)
Benzodiazepines	100.00% (100.00-100.00%)	93.06% (89.89-96.24%)	5.56% (2.69-8.42%)	100.00% (100.00-100.00%)

* Because of no false-negative result, the values in MDMA and barbiturates assay were not presented

results of 233 urine samples were in agreement (positive in 8 and negative in 225). False positive results were found in 13 urine samples but there was no false negative result. The sensitivity, specificity, positive predictive value, and negative predictive value with their 95% CI were 100.00% (100.00-100.00%), 94.54% (91.70-97.38%), 38.10% (32.03-44.16%), and 100.00% (100.00-100.00%), respectively (Table2, 3: Methamphetamine). In eight true positive urine samples, all of them had methamphetamine, but a single methamphetamine was detected in four ranging from 0.21 to 2.31 µg/ml. Others had both methamphetamine (not less than 0.21 µg/ml) and amphetamine. In 13 false positive urine samples, the REMEDi™ HS system could not detect any drugs in eight, pseudoephedrine was detected in three ranging from 0.80 to 6.52 µg/ml, 8.99 µg/ml of pseudoephedrine, 1.77 µg/ml of phenylpropanolamine was detected in one, and 6.10 µg/ml of phenylpropanolamine was detected in one.

Benzodiazepines assay

The ADVANCED QUALITY™ One Step Multi-Drug Screen test and the REMEDi™ HS system results of 229 urine samples were in agreement (positive in 1 and negative in 228). False positive results were found in 17 urine samples but there was no false negative result. The sensitivity, specificity, positive predictive value, and negative predictive value with their 95% CI were 100.00% (100.00-100.00%), 93.06% (89.89-96.24%), 5.56% (2.69-8.42%), and 100.00% (100.00-100.00%), respectively (Table 2, 3: Benzodiazepines). In the true positive urine sample, 0.11 µg/ml of alprazolam was detected. In 17 false positive urine samples; the REMEDi™ HS system could not detect any drugs in five, amitriptyline was detected in two ranging from 0.23 to 0.41 µg/ml, methadone was detected in two ranging from 0.23 to 0.41 µg/ml, morphine was detected in two ranging from 0.31 to 2.24 µg/ml, 1.94 µg/ml of cocaine was detected in one, 0.54 µg/ml of tramadol was detected in one, norfloxacin was detected in two, sildenafil metabolite was detected in one, and domperidone metabolite was detected in one.

MDMA assay

The ADVANCED QUALITY™ One Step Multi-Drug Screen test and the REMEDi™ HS system results of 231 urine samples were in negative agreement but no result was in positive agreement. False positive results were found in 15 urine samples but there was no false negative result. The sensitivity, specificity, positive predictive value, and negative predictive value could not be calculated because there was no true positive result (Table 2, 3: MDMA). In 15 false positive urine samples, the REMEDi™ HS system could not detect any drugs in eight, 8.99 µg/ml of pseudoephedrine and 1.77 µg/ml of phenylpropanolamine were detected in one, 3.21 µg/ml of dextromethorphan and tramadol metabolite were detected in one, 2.20 of propylhexedrine was detected in one, cocaine and morphine and their metabolites were detected in one, 6.10 µg/ml of phenylpropanolamine was detected in one, and roxithromycin was detected in two ranging from 1.09 to 3.08 µg/ml.

Barbiturates assay

The ADVANCED QUALITY™ One Step Multi-Drug Screen test and the REMEDi™ HS system results of 245 urine samples were in negative agreement but no result was in positive agreement. False positive results were found in one urine sample but there was no false negative result. The sensitivity, specificity, positive predictive value, and negative predictive value could not be calculated because there was no true positive result (Table 2, 3: Barbiturates). The REMEDi™ HS system could not detect any drugs in one false positive urine sample.

All assays

The conclusion of comparative results between the ADVANCED QUALITY™ One Step Multi-Drug Screen test and the REMEDi™ HS system confirmation method is presented in Table 2. All sensitivities, specificities, positive predictive values, and negative predictive values are presented in Table 3.

Discussion

Screening urine samples from the corpses by using on-site urine immunoassay test is necessary in forensic work because in Thailand, the police are leaders in the investigation of medicolegal death and the forensic doctors are assistants. When a case possibly involve drugs of abuse, it is very important to have a preliminary report that can be made on-site within 10 minutes. For example, in the present research there was one case that died of opiate intoxication due to body packer syndrome. Multiple plastic packages containing heroine were found in the deceased's stomach. Firstly, the white powder that was found in these packages was not identified but the police

wanted the report to calculate cost and transport route. Therefore, this on-site test was used beneficially.

Overall, the ADVANCED QUALITY™ One Step Multi-Drug Screen tests for the rapid detection of drugs of abuse fulfill the requirements of forensic investigation in term of practicability and handling. Anyone reading the instruction manual before using this test, even personnel using it for the first time, will find it difficult to make mistakes.

In some previous researches[14,15], many urine samples taken postmortem contained substantial amounts of sediment that tended to block the nylon membrane of the tests and prevented the reaction mixture from being completely absorbed. Therefore, it was slowly absorbed and the tests were hard to interpretation in the setting time of the manual. However, in this test, the sediment did not interfere with the interpretation because the devices were held in the urine until a reddish color appeared at the lower edge of the test membrane.

One problem in this device was the color intensity of the purple bands. The MDMA and benzodiazepines strip of some devices slowly produced purple bands in test areas. These purple bands did not appear until 5 minutes. This may due to the assay response function which did not increase steeply enough within less time. Hence when reading between 5-8 minutes after withdrawing the devices from urine samples, the purple bands appeared prominently and the false positive tests deceased in both assays.

The cocaine test proved to be the most reliable. None of the tests showed any discrepancy when compared with the REMEDi™ HS system. It could detect cocaine in lower level of reactivity, as shown in Table 1.

The opiates assay proved to be reliable with 100% sensitivity and high specificity. When there was only morphine, it could be detected in lower level of reactivity as shown in Table 1. Furthermore, low concentration of heroine metabolite, monoacetyl morphine, mixed with low concentration of morphine was detected in lower than a level of reactivity in Table 1. The reason for four false positive tests was not clear.

The methamphetamine assay proved to be reliable with 100% sensitivity and high specificity. The false positive results could divide in two categories. One was the results that pseudoephedrine or phenylpropanolamine or both were detected by using REMEDi™ HS system. The concentrations of

these were lower than levels of reactivity in Table 1. These may be due to some assay response functions increased more rapidly than normal. Two were the results that the REMEDi™ HS system did not detect anything. In the previous researches[14,15], substances produced in postmortem urine were clearly identified as cross reacting substances that caused false positive results. These substances were tyramine[14], a decarboxylation of tyrosine, or phenethylamine[15], and a putrefactive amine. Both substances were not detected by using the REMEDi™ HS system. This may be the causation that could not detect anything in these urine samples.

The benzodiazepines assay proved to be reliable with 100% sensitivity and high specificity but the most false positive results were found. These results were detected with variable substances that were amitriptyline, methadone, morphine, cocaine, tramadol, norfloxacin, sildenafil metabolite, and domperidone metabolite. All of them were not in Table 1 and were not in the same groups. Furthermore, the REMEDi™ HS system did not detect anything in some urine samples. In the last part of the present research that the authors read between 5-8 minutes after withdrawing the devices from urine samples, the false positive tests deceased but still appeared. Therefore, it was not clear enough to explain these false positive results.

The MDMA and barbiturates assay could not be evaluated because there was no true positive result but they still had values that both of them did not have a false negative result.

One major problem in using the REMEDi™ HS system results as the gold standard is that this system is not a specific analytic method. It cannot detect some substances or low concentrations of some substances that may cause many false positive results and low positive predictive value, especially in benzodiazepines assay. Furthermore, the cross-reactivity of a number of structurally similar compounds, especially in methamphetamine assay, can cause many false positive results and low positive predictive value. Other problem in this research is a small number of positive samples from 246 urine samples. Therefore, more research about this on-site test should be done.

Conclusion

With respect that there was no false negative result in all assays and there were high specificities in four of six assays, the ADVANCED QUALITY™ One Step Multi-Drug Screen test can be classified as

reliable for drugs of abuse screening in postmortem urine and is as suitable as REMEDi™ HS system for forensic medicine. Furthermore, this test is rapid and requires only a small sample volume. However, this test has many false positive results. Therefore, a specific procedure is necessary to confirm all positive results.

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การใช้ชุดทดสอบทางอิมมูโนวิทยาสำหรับสารหลายชนิด ในการตรวจสารเสพติดอย่างรวดเร็วกับปัสสาวะหลังเสียชีวิต

สมิทธิ์ ศรีสนธิ์, ธำรง จิรจริยาเวช, วิชาญ เปี้ยวนิ่ม

วัตถุประสงค์: ADVANCED QUALITY™ One Step Multi-Drug Screen test คือชุดทดสอบทางอิมมูโนวิทยา ณ ที่เกิดเหตุแบบใหม่ที่ใช้ตรวจหาสารเสพติดหลายชนิดภายในครั้งเดียว (สารประเภท barbiturates, benzodiazepines, cocaine, methylenedioxymethamphetamine (MDMA), methamphetamine และ opiates) ดังนั้นการศึกษานี้จึงทำเพื่อประเมินคุณสมบัติในการวินิจฉัยของชุดทดสอบนี้

วัสดุและวิธีการ: การศึกษานี้ใช้ตัวอย่างปัสสาวะซึ่งเก็บจากศพคดีที่ผ่านการผ่าศพที่หน่วยนิติเวช โรงพยาบาลรามาธิบดีตั้งแต่เดือนตุลาคมปี พ.ศ. 2550 จนถึงเดือนมีนาคม ปี พ.ศ. 2552 ซึ่งประเมินคุณสมบัติในการวินิจฉัยของชุดทดสอบนี้โดยเทียบกับระบบ rapid emergency drug identification high sensitivity (REMEDi™ HS)

ผลการศึกษา: จำนวนตัวอย่างปัสสาวะที่ใช้ในการศึกษานี้ 246 ตัวอย่าง โดยค่าความไวกับร้อยละ 95 ของช่วงค่าความเชื่อมั่นสำหรับการทดสอบหา cocaine, opiates, methamphetamine และ benzodiazepines คือ 100.00% (100.00-100.00%) ในแต่ละการทดสอบ ส่วนค่าความจำเพาะกับร้อยละ 95 ของช่วงค่าความเชื่อมั่นสำหรับการทดสอบเหล่านี้คือ 100.00% (100.00-100.00%), 98.35% (96.75-99.94%), 94.54% (91.70-97.38%) และ 93.06% (89.89-96.24%) ตามลำดับ ส่วนการทดสอบหา MDMA และ barbiturates ไม่สามารถประเมินได้ เพราะไม่มีผลบวกจริง

สรุป: ADVANCED QUALITY™ One Step Multi-Drug Screen test เป็นชุดทดสอบที่น่าเชื่อถือได้ในการตรวจคัดกรองหาสารเสพติดในปัสสาวะหลังเสียชีวิต