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LETTER FROM CANADA

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Is it the time to bid adieu to conventional viscera preservation in India?

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All over the world viscera preservation and its subsequent analysis at forensic laboratories plays a major role in detecting the unknown substances which allegedly killed a person. It's quite routine for a forensic medicine practitioner to preserve viscera samples at the time of autopsy, if an autopsy surgeon finds something suspicious or to ascertain the exact cause of death with findings corroborative at autopsy. From the time of the viscera sample preservation to the handing over to police, to its subsequent submission at forensic laboratory and finally return of the chemical analysis take quite a considerable amount of time. In India, this waiting period may range from one year to many years (personal experience), and during this time the final opinion regarding the cause of death remains pending. As a general practice in India, it depends on the severity of the case on how quickly the viscera can be analyzed at a forensic science laboratory. Cases such as alleged dowry death, sexual assault or homicide may get early chemical analysis report as compared to other cases such as poisoning, road traffic accident or fall from height. In this editorial I am not going to discuss about measures that can be undertaken to reduce the time of viscera analysis at the forensic laboratory, but I will discuss how we may adopt a standard practice of preservation of blood, urine and vitreous humor samples for toxicological analysis which is currently implemented by one of the developed nations such as Canada

Figure 1. Blue top and white top tube. (Click picture to enlarge)

My journey as a forensic practitioner began in 2007 when I joined the Maulana Azad Medical College as a first-year postgraduate student. Since then I have listened to infinite instances of troubles related to viscera preservation. The most common problem with viscera preservation is its subsequent leakage while in transportation to police stations and then to the forensic science laboratory. The most horrific incident which I received was that a viscera box was dropped while in transportation to the laboratory. The glass jar was broken, and the entire contents including the stomach, intestine, liver, kidneys and spleen spilled out on to the busy road. It can easily be understood when this kind of mishap happens it leads to a permanent loss evidence. At this point, I would like to mention that these incidences should not be construed as lack of ability on the part of police, rather I would state that police personals are very hard working. I never miss any opportunity to praise them for their professionalism. The only objective of highlighting these kinds of incidences is to raise awareness that this type of cumbersome viscera preservation is not required.

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Deaths among young and middle-aged people due to drug intoxication is a perplexing and pressing issue all over the world. Every country has different ways to address the problem of drug intoxication. Identifying the offending drugs and its quantity at autopsy aids the public authority to amend the law for preventing future deaths. This editorial will focus on the current standard which is followed by the Ontario Forensic Pathology Service (OFPS) and all pathologists who perform autopsies under The Corner's Act. Every death investigation in the province Ontario governed by The Coroner's Act. Under Sec 10 of The Coroner's Act, the coroner orders an autopsy in cases which sudden and unexpected in nature.

Figure 2. Blue top tube with intact and tampered seal. (Click picture to enlarge)



The forensic pathologist performs an autopsy by written orders of coroner's warrant. Currently 18 forensic pathologists, 11 pathologist assistant (PA), 5 forensic service technologists (FST) and 2 forensic photographers are working at Provincial Forensic Pathology Unit (PFPU). According to the Centre of Forensic Sciences (CFS), when analysis occurs they classify unnatural deaths into two categories (i). "coroner deaths" when there is no clear cause of death, if there is any drug implicated, death from fire, workplace deaths, motor vehicle or aviation deaths and military deaths. The other category is (ii) "criminal deaths" are which of serious nature like sexual death, death due to assault, impaired driving and administration of noxious substance. During toxicological analysis preference will be given to latter category due to its serious nature. Currently 12 forensic scientists are employed at CFS, which is located at Toronto, Ontario. Out of 12 scientists nine scientists are fully dedicated for analyzing toxicological samples of criminal cases and the remainder of the scientists deals with coroner cases.

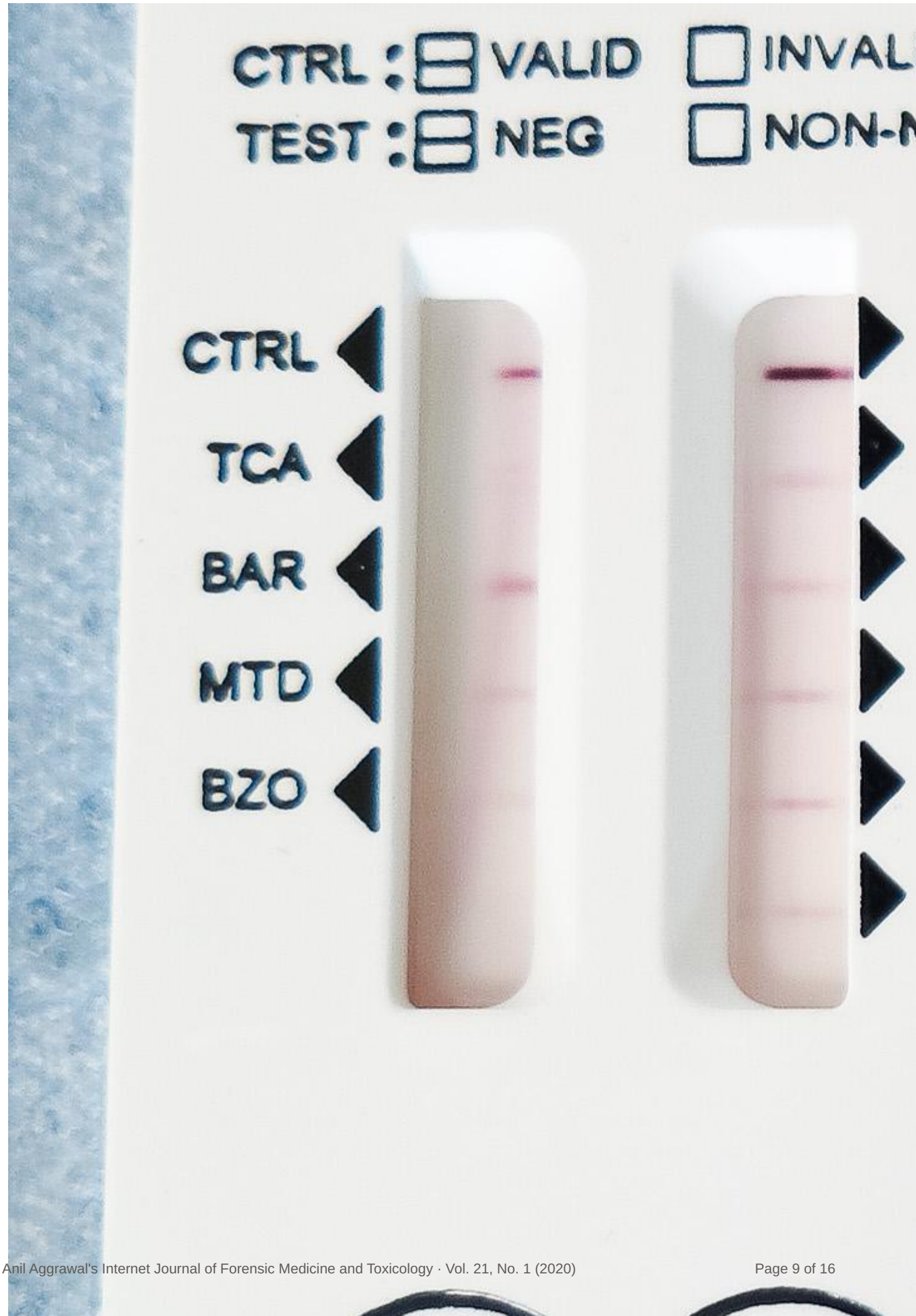
At autopsy as per the standard protocol three biological samples are taken i.e blood, urine and vitreous humor. The source of blood is two blood samples from femoral vein and one blood sample from heart. Only one blood sample is enough for analysis, but 3 blood samples are taken to reduce the bottle neck of analysis at CFS. The blood sample is taken in 14ml tube pre-powdered preservative with sodium citrate/sodium fluoride. In routine practice 10 ml of blood is required. Blue top tubes are used for blood and urine collection, white top tube used for vitreous humor (Fig 1). Pathologist assistant (PA) seals the samples with tamper resistant seals bearing a unique barcode and identifier. The Pathologist assistant (PA) will enter these samples into F Path (Internal software system for Post-mortem services). Once the samples are entered in the F path, the Forensic Services Technologist (FST) will retrieve and store the samples. If someone tries to tamper with sample by removing seal after preservation, storage or during transport, VOID will appear on the tube and seal (Fig 2).

Figure 3. Sealed tubes in poly bag ready for transfer. (Click picture to enlarge)



Therefore, if a VOID appears on the tube then CFS takes note while receiving the samples. All the samples collected on any day will be stored in the refrigerator overnight. On the following day all the samples are entered into CFS software system called Laboratory Information Management System (LIMS). After entering the details in LIMS, samples are finally submitted at CFS in polythene bags by FST (Fig 3). It is important to note here that no police personal is involved in the transportation of samples to the CFS. Importantly the bag is quite smaller easy to transport unlike large viscera box. There is also a screening kit available for testing various drugs. As a rule, if screen test is positive then a full toxicological analysis is recommended. Screening is only done in cases where anatomical cause of death is found at autopsy and to evaluate the role of any drug in the cause of death (Fig 4).

Figure 4. Screening kit. (Click picture to enlarge)


CTRL : VALID
TEST : NEG
CTRL
TCA
BAR
MTD
BZO

There are many toxicology panels available at CFS for analysis and the forensic pathologist must choose the correct panel depending upon the case history and the autopsy findings (Fig 5). The two most commonly used panels are the ‘exclusionary toxicology’ panel and other one is ‘suspected overdose’ panel. In the exclusionary toxicology panel, anatomical cause of death is ascertained at autopsy, but it is done only to rule out common poisons. The suspected overdose panel is recommended only when there is high degree of suspicion of drug overdose.

Figure 5. Toxicological panels. (Click picture to enlarge)

Centre of Forensic Sciences Toxi

Submissions are accepted based on the al
questions. The CFS does not perform clinica
monitoring. Notwithstanding the analyses id
the analytical approach. For information ab
Sheets posted on the CFS website (www.on

Case Type	Accepted
Rule out (Exclusionary)	Yes
Anatomical cause of death present but nee	
Suspected drug overdose	Yes
Death is suspected to have resulted from a	
Fire or CO related death	Yes
For deaths related to fires or in which carb	
blood carboxyhaemoglobin unless addition	
extended survival following suspected CO	
Traumatic Suicide	No♦

Turn Around Time (TAT) is the total time taken by CFS, for analysis of the samples and preparation of result report. At CFS, the average TAT is about 45 days and for criminal cases it is less than 30 days. Data on the sample report consist of identifying data of case (hidden), result of analysis, note on substance analysis and on next page remarks (Fig 6 & 7). The remarks section contains details of the procedure used for the analysis and their respective utility. The important observations that can be made in the sample report are presence of various legends in capital letters T, D, I and MU. (T) represents toxicologically significant, (D) stands for could cause death, (I) represent Interpretative data note and (MU) stands for Measurement uncertainty. All the CFS reports are sent directly to pathologist via secure email. If the pathologist finds the CFS report inadequate in terms of result or he/she wants detail analysis report then request can be made electronically via email at CFSToxicologycordinator@ontario.ca. It can be observed in the attached CFS report that carfentanil, fentanyl, cocaine and benozlyecgonine are detected in the blood during analysis. Carfentanil concentration is significantly higher than the fatal range. In the final opinion, the death was attributed to combined toxicity of carfentanil, fentanyl and cocaine.

Figure 6. Sample report page no.1.. (Click picture to enlarge)

RESULTS

Item 2 Femoral Blood

Carfentanil:	0.4
Fentanyl:	<
Cocaine:	>
Benzoylecgonine:	>
Hydromorphone:	no
Mirtazapine:	no
Morphine:	no
Sertraline:	no

Item 3 Femoral Blood

Levamisole:	ter
Phenacetin:	ter
Acetaminophen:	ter
β-Hydroxybutyrate (BHB):	no

Item 1 Femoral Blood

By analyzing the stomach contents, liver or any other internal organ tissue, we can detect the presence of the substance in the stomach or in tissue. This is often a qualitative analysis and not a quantitative analysis. To opine whether a substance could cause death or not the substance should be present in the blood. Also, quantification of the substance is necessary, as only few drugs such as cocaine and amphetamine can cause death with recreational concentrations. I feel it is incumbent for various stake holders like The Society of Toxicology of India, Indian Academy of Forensic Medicine etc. to start a dialogue not only with each other but also with stakeholders in Canada or USA. They should start an effort to bring new advancements at home which is best suited for India's needs in terms of reducing backlog, reducing TAT and to better serve the justice system.

Figure 7. Sample report page no.2. (Click picture to enlarge)

LEGEND T Toxicologically
I Interpretive Da

REMARKS

A list of drugs detected by the m
Information Sheets – Toxicology.

In item 2, no other significant find
Mix 3.

In item 3, no other significant fi
Screen and GHB/BHB method.

In item 1, no significant findings
FID.

This summary contains analytical re
Numerical values are reported ± m
the analytical method with 95.45%
finding of "detected" means the dru
toxicologically significant. For the

Acknowledgements

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Further reading

1. Centre of forensic sciences, Ontario. https://www.mcscs.jus.gov.on.ca/english/centre_forensic/CFS_intro.html.
2. Health Canada Drug Analysis Service. https://www.canada.ca/en/health-canada/services/health-concerns/controlled-substances-precursor-chemicals/drug-analysis-service.html