LGC Standards

Excellence through measurement

Variation in sampling – The death of toxicology

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Garbage in, Garbage out (GIGO)

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"Sampling is the most important step in drug analysis because an analytical result will never be better than the sample from which it is derived"

Skopp, G. Preanalytic aspects in post-mortem toxicology (2004) *Forensic Sci. Int.* 142;75-100

"Specimen acquisition is often the most critical, yet overlooked component of STA"

TIAFT Committee of Systematic Toxicological Analysis

Introduction

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The effects of non-routine sampling and post-mortem redistribution are well understood among the toxicology community

A recent pilot study explored variation in post-mortem liver sampling and its implications for post-mortem toxicology interpretation

- There is a significant lack of knowledge of liver sampling requirements
- The lack of knowledge is in part due to toxicology laboratories not ensuring that the pathologists had been provided with the appropriate information
- It would be advisable for all toxicology laboratories to audit the practice of the pathologists providing samples for analysis

Morley, S. R. & Bolton, J. Variation in post-mortem liver sampling: implications for post-mortem toxicology interpretation. (2012) *J Clin Pathol.* 65 (12):11367

Method

When: In Autumn 2012

How: SurveyMonkey™

To who: AAPT Association of Anatomical Pathology Technologists (n=250)

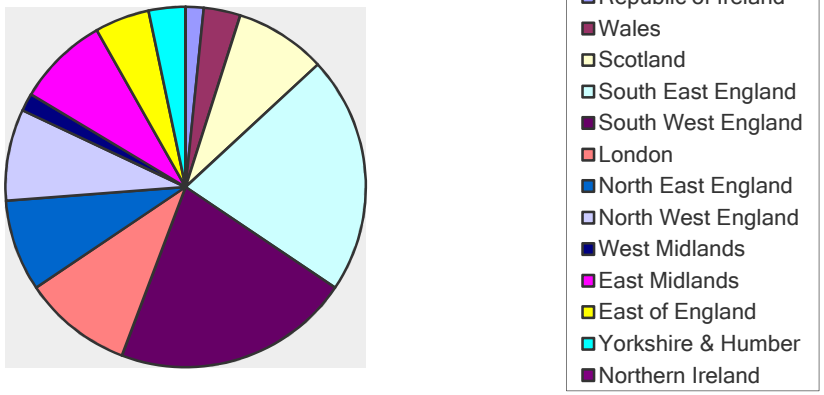
The survey: 20 Questions

Demographics / Sampling Practice / Training → Routine (non-forensic)

18 x ☑ 2 x ≈

Results - Demographics

Response rate: n=63 (25%)



It is likely that a proportion of these responses represent a mortuary rather than an individual

There are 234 mortuaries licensed to carry out post-mortem examinations in the UK;

- England…….204
- Scotland…….17
- Wales……..12
- N. Ireland…….1

http://www.hta.gov.uk/licensingandinspections/listoflicensedestablishments.cfm

Results - Sampling

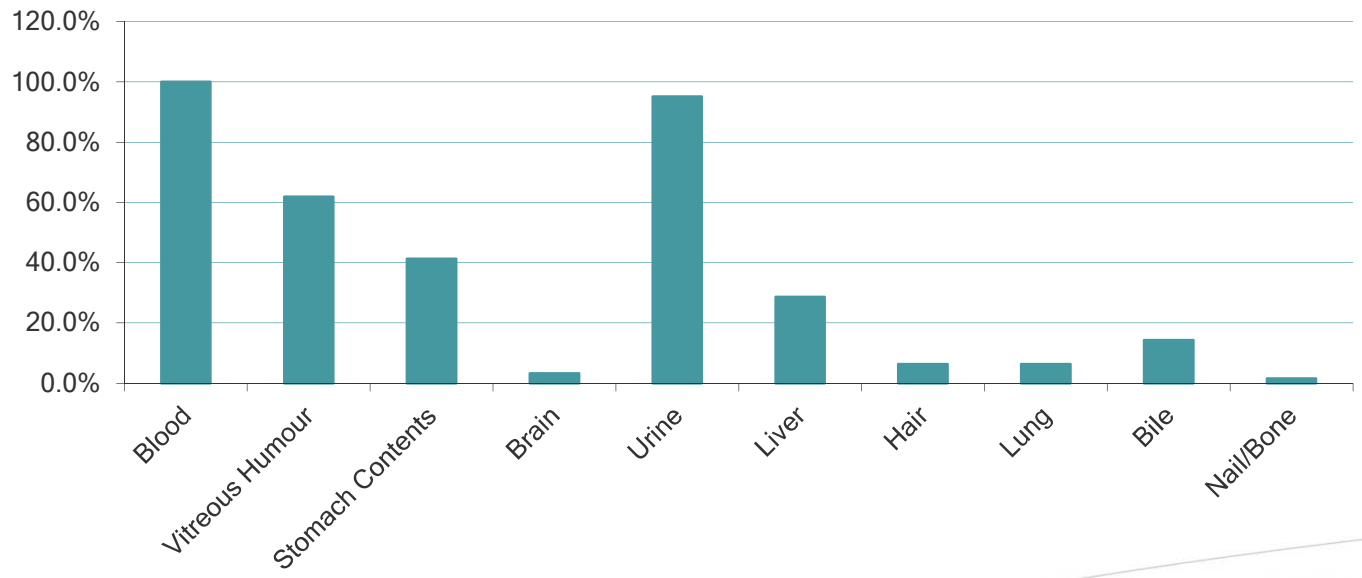
2. Who typically collects the samples during a routine post-mortem?

Pathologist: 6.3%

APT: 93.7%

Results - Sampling

3. If toxicology is required, what samples are usually collected?



Liver: Unable to sample blood or urine / Decomposition / Embalming

Stomach Contents: Oral overdose

Results - Sampling

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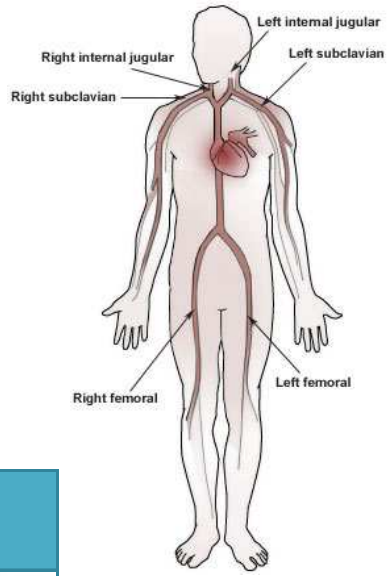
6. Number the following blood sampling sites in order of preference for quantitative toxicology analysis
(1 = most appropriate, 4 = least appropriate)

Cavity [ ]
Subclavian [ ]
Femoral [ ]
Cardiac [ ]



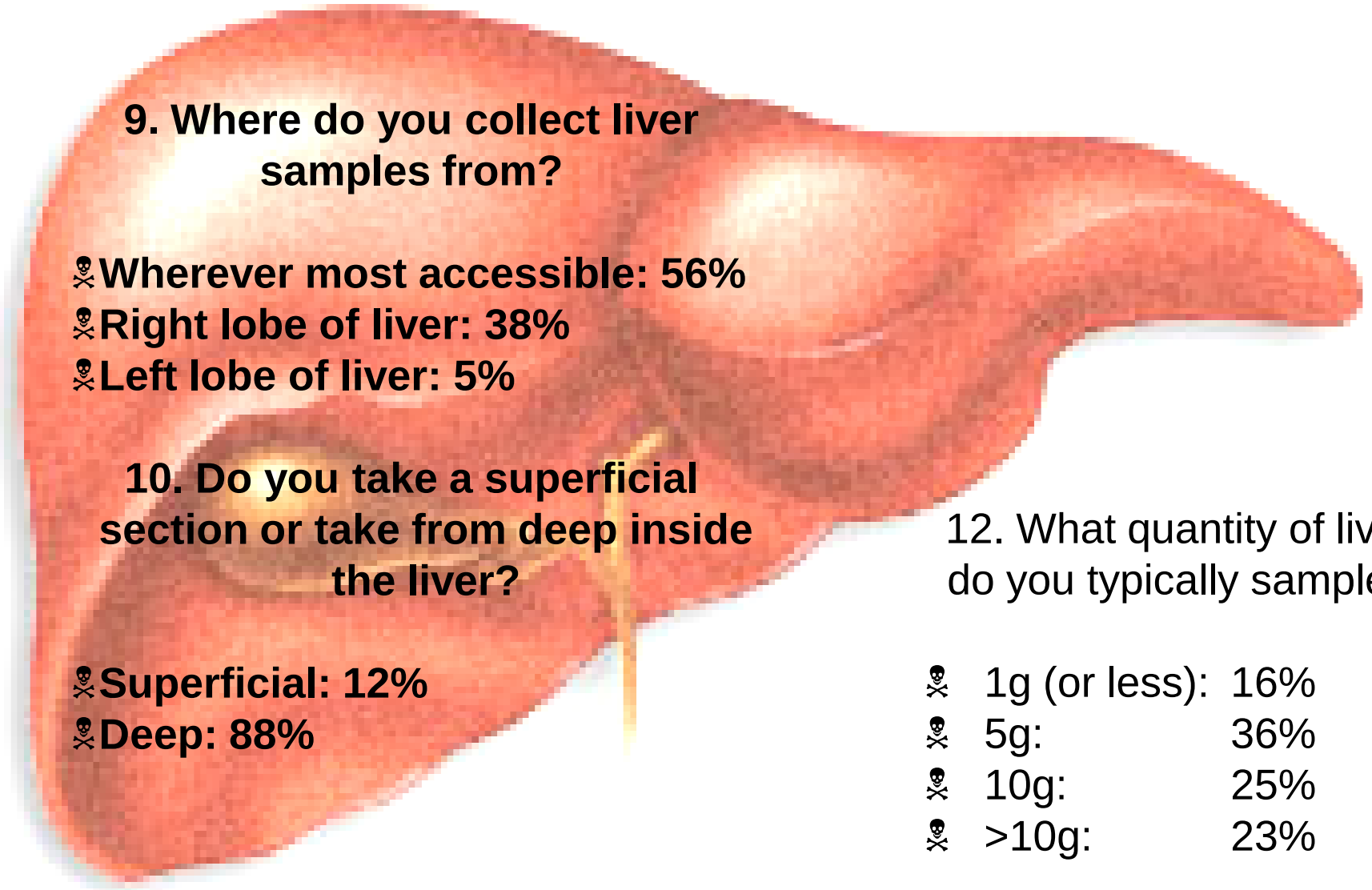
Answer Options	1	2	3	4
Cavity	0	0	5	58
Femoral	62	0	1	0
Subclavian	0	56	7	0
Cardiac	1	7	50	5

Results - Sampling

5. Please briefly describe your routine procedure for post-mortem blood sampling (i.e. sampling site, ligation/no ligation, volume, preservative/no preservative etc)

- 5% (n=3) routinely collected heart blood as sample of choice
- 13% (n=8) ligated the vessel
- The majority collected both plain and preserved blood
- 20 mL was the most common volume of unpreserved blood sampled (Range 2-30 mL)
- 5 ml was the most common volume of preserved blood sampled (Range 2-7 mL)

Results - Sampling



9. Where do you collect liver samples from?

- **Wherever most accessible: 56%**
- **Right lobe of liver: 38%**
- **Left lobe of liver: 5%**

10. Do you take a superficial section or take from deep inside the liver?

- **Superficial: 12%**
- **Deep: 88%**

12. What quantity of liver do you typically sample?

- 1g (or less): 16%
- 5g: 36%
- 10g: 25%
- >10g: 23%

Results - Sampling

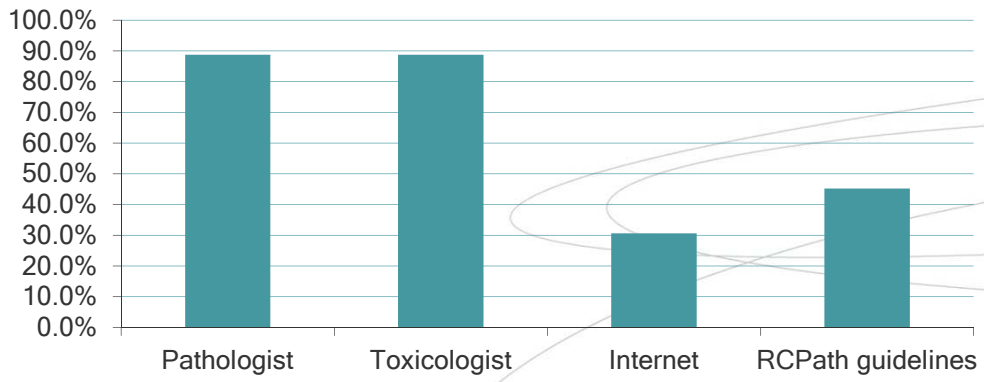
11. Do you specify the origin on sampling on the labels and/or submission form?

Results - Training

14. Are you aware of any standards for best practice on post-mortem sampling for toxicology?

46% ☑
54% ☒

15. What resources do you use to plan sampling in a suspected unusual poisoning (select as many as applicable)?



Results - Training

16. Do you feel you need more guidance on post-mortem sampling?

50% ☑
50% ☒

17. In order of priority (1 = most relevant, 5 = least relevant) whose responsibility do you think it is to provide guidance on post-mortem sampling?

Answer Options	1	2	3	4	5
Own study	0	16	10	17	19
Employer	6	8	20	14	14
Toxicology Provider	46	8	6	1	1
Association of Anatomical Pathology Technology	2	16	17	21	6
Royal Society of Public Health	8	14	9	9	22

Others: Pathologists, RCPath, HTA, Coroner's Society

Conclusions

- A post-mortem is carried out in 1 in every 5 deaths in E&W
- Twice as many as the rest of the western world
- The increased emphasis on laboratory accreditation and measurement uncertainty is, to a large degree fruitless unless attempts are made to address pre-analytic error
- Whilst we acknowledge that these issues cannot be eliminated entirely, appropriate steps should be taken to reduce their contribution to uncertainty

Conclusions

- Are we putting greater focus on ensuring appropriate caveats are applied to reporting than minimising the occurrence?
- Are we guilty of writing sampling guidelines for toxicologists and not pathologists / APT's?
- Is post-mortem sampling outside of our control?

Moving Forward

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Modernising Scientific Careers (MSC)

Government initiative to address the training and education needs of the whole healthcare science workforce in the NHS

- MSC team are currently working on the development of a BSc in Anatomical Pathology Technology with the University of Chester

- The qualification required for registration

Improved communication: Toxicologist ↔ Mortuary

More collaboration between professional bodies for toxicology and pathology

Acknowledgements

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