Thursday , 15 June 2017
(10.05 am)
MR SKELTON: Sir, the next witness is Dr Perry.
THE CORONER: Yes.
DR FIONA PERRY (sworn)
Questions from MR SKELTON
MR SKELTON: Dr Perry, would you state your full name to the court, please.
A. Yes, my full name is Dr Fiona Claire Perry.
Q. Could you describe your present position, please?
A. Yes, I am employed by LGC Forensics and have been since March 2012. Previously to that, up to February 2012 from 1998, I was employed by the Forensic Science Service London Laboratory.
I am employed as a forensic toxicologist specialising in the analysis of body samples, mainly blood and urine, for alcohol, drugs, medications, some poisons and the interpretation of the results.
Q. How long have you been working in that field?
A. Since 1998.
Q. From what you were saying, the majority of what you are testing for is not poisons, it is for other substances?
A. Yes, it is mainly alcohol, drugs of abuse and medications. We do cover some poisons, things like carbon monoxide, a few plant poisons but it is mainly

drugs, medications, alcohol.
Q. You are not I think dual qualified as a physician, are you?
A. I am not, no. I have no medical qualifications.
Q. Thank you.
In your evidence today the focus is going to be on the science of the testing that you undertook and the views you have taken from a scientific perspective. I would like if I may ask you to delineate where you are getting into an area that you feel is more for the clinicians, we will of course be hearing from two other experts in the field, Dr Rice, who is a pathologist I think, and Professor Ferner who is a physician as well. Both of whom you have met?
A. I have, yes.
Q. I think in your joint statement there are clear areas where you say that is for those experts?
A. That's correct, yes.
Q. Thank you.
You have produced quite a few documents to the court. Can I just run through them and see if your recollection accords with mine?
A. Yes.
Q. You produced your first statement not long after Mr Perepilichnyy's death, 24 December 2012.

You have a copy in the bundle if you want to look at it.
A. That might be easiest.
Q. If you have the bundle there, it is tab 32, page 162?
A. I think it is in file 1.
Yes.
Q. Unless you want to there is no need to look them up, I am just going to run through the documents for the record.
A. Okay.
Q. A second statement in April 2013.
A. Yes.
Q. A third statement, 5 June 2013.
A. Yes.
Q. More recently you produced a short fourth statement, 8 June this year --
A. Yes.
Q. -- dealing with one particular issue, which we will come on to.
A. Yes.
Q. You also produced two emails in response to issues that were raised during the coronial investigation last year, dated 24 May.
A. Yes.
Q. Obviously you have the note of the meeting that you had

recently with Professor Ferner and Dr Rice.
A. Yes.
Q. You also produced an addendum in fact because you wanted to go away and find some particular answers that you didn't have at your fingertips.
A. Yes, that's correct, yes.
Q. Thank you.
As a matter of generality, do you stand by the professional opinions that you have expressed in those documents, subject to clarification in the joint report and your evidence today?
A. I do, yes.
Q. Thank you.
Can I start with some generic issues, please. What does a standard toxicology screen test for or look for?
A. It will test for, in most cases alcohol and common drugs of abuse. There may be a request for medicinal drugs, which generally covers prescribed drugs that affect behaviour, so things like antidepressants, antipsychotics, antihistamines.
It doesn't cover all medications, just a particular batch that might affect behaviour.
Q. Are you commonly called upon to provide views in the context of coronial investigations?
A. Yes, we do both police investigations and those for the

coroner.
Q. So criminal investigations as well?
A. Yes.
Q. Just as a matter of generality again, there are some poisons that are not going to be detected on a standard toxicology screen?
A. Yes, most poisons do need a specific test so there are very few that would be detected during the general screen, unless you are including overdoses from drugs like heroin, morphine, cocaine, et cetera but what is considered traditionally as a poison, for example plant poisons wouldn't be detected by a general screen.
Q. As you say some require a specific test, so for example polonium 210, which killed Mr Litvinenko, would require a specific type of test to find that?
A. It certainly would, yes. We certainly don't deal with any tests for radioactive material at all.
Q. To what extent is the ability to test for poisons determined by the quantity and quality of the samples?
A. There is likely to be a large number of tests that will need to be conducted specifically for that poison or a group of poisons. Each test might take quite a large sample of the either blood or urine, whatever you are testing. It is not as simple as just doing a screen for drugs for abuse and medications, you are likely to need

to use a lot more sample.
Q. In terms of the quality of the sample, as a matter of generality how much does that matter in relation to blood or urine?
A. Generally, we, for alcohol, we require preserved samples because microorganisms in samples can either produce or break down alcohol in samples. For forensic purposes the samples are preserved with fluoride, sodium fluoride, so both blood and urine we would like preserved samples.
Q. The issue of the timing of testing, for the most part, most of the things that you are looking for, the list of things you have already given, you are going to find in your initial tests but if there is sometimes a delay in the testing, is it possible that you are simply not going to find things because the compound or whatever it is has effectively gone, degraded?
A. Yes, ideally, tests for most substances will be fine if they are conducted within a matter of weeks. If the samples are frozen you can certainly delay testing for longer.
There are some substances that we know that break down and we know what they break down to, so we cover those. But there are some substances that are very unstable in samples and would need to be tested for very

quickly.
Q. Is cyanide an example of that?
A. It is, yes.
Q. We will come on to the other types in due course because it is something you deal with in your joint statement.
Are there some poisons which are simply undetectable after death by toxicology or pathology?
A. Yes, we do need to be guided by what is most likely because of the sheer number of drugs, substances that can be considered a poison, we do need to be guided by symptoms available from the post mortem, so that we can target the most likely substances first and then continue on continuing tests until we run out of sample, basically.
So yes, we do need to be guided by symptoms at the post mortem which can be a useful guide towards what might be most likely. It can never tell you exactly what is going to be present but it can narrow down the test to the most likely substances first.
Q. The pathologist may say it looks like there is liver damage in this individual --
A. Yes.
Q. -- it doesn't look like it is a structural abnormality or a disease of any kind, can you try and tell me if there is something that has affected the liver. That

will give you an idea of what to look for?
A. Yes, for example paracetamol overdoses they produce severe liver damage normally and possibly kidney as well. You would expect some signs at post mortem from a paracetamol overdose.
Other signs would be burning in the oesophagus or the stomach from anything that is acidic or corrosive. A lot of plant material in the stomach that could indicate somebody had recently taken something of a plant nature. Yes there are various signs -- it would be useful indicators, but just because they weren't present doesn't necessarily mean that that substance hasn't been ingested.
Q. You may be guided by the pathology, you may also be guided by clinical signs and symptoms that are given to you in evidence in some form after the death?
A. Yes, clinical signs and symptoms and the circumstances surrounding the case, so where somebody was found.
Q. In this case, you are probably aware I think you sat in court yesterday and you may also be aware from other evidence that the clinical signs and symptoms -- there were some signs but they may not be signs of poison they were also consistent with a cardiac event, at least that is the evidence that has so far been put before the court.

If someone's heart stops, but you don't have obvious pathological signs or obvious clinical signs of poisoning, where do you start in terms of looking for poisons?

A. We would start with the most commonly available ones, so common drugs of abuse and medications, those that are easy to get hold of. We would cover carbon monoxide if it was likely to be a case where carbon monoxide amongst was involved, that didn't seem to be applicable in this case.

We would then expand to a wider range, maybe do plant poisons if plant poisons were considered likely but we only cover a small batch of plant poisons. We have tests for rodenticides, so substances that you use to kill mice, et cetera, but we are very much guided by the information that is given to us by the police and including from the post mortem.

MR MOXON BROWNE: Sir, I am having a little difficulty in hearing.

THE CORONER: I was thinking that that might be the case. You can just see it is a huge room so can you just -- I am not sure those actually -- I think they are all just working to make sure things are recorded so those won't help, but if you can just turn your own volume up, is that all right?

A. I will do, sir, I apologise if you cannot hear.

THE CORONER: Not at all. Thank you.

MR SKELTON: Thank you.

There is the pathology, there is the quasi-medical evidence about clinical signs and symptoms, also circumstantial information?

A. Yes.

Q. It appears that this person had an animus towards the deceased and was capable of poisoning in this way, a partner for example or a work colleague who may have had access to a certain type of poison. Does that guide you to some extent?

A. It would do, yes. We would ask if there is a suspect available and whether they have access to any materials, whether anything was found at the home address, whether there was any evidence of computer searches, for example. Anything to guide us into the possible substance that might have been used.

Q. You are not I think, at your laboratory, looking for chemical weapons?

A. No.

Q. What about nerve agents that could be used for assassination, for example?

A. No, we don't have any test for nerve agents and we are not privy to the information that would enable us to know what substances might be used for chemical warfare.

Q. That is getting into sort of Government territory, is it?

A. It is. We don't have the security clearance for that information.

Q. What about organophosphates which are I think available or can be created from materials that you can get publicly, do you test for those sorts of things?

A. We have a test that might detect some of them but not very many of them.

Q. But what, sorry?

A. Not very many of them.

Q. Some but not all?

A. Yes.

Q. Going back to my original question about whether or not there are poisons which are simply going to be undetectable, I appreciate that because you are not dealing with chemical weapon or chemical weapon like poisons that puts that in a certain category but from your perspective are there such poisons, that you feel as a chemist, "I am never going to find."

A. Yes, but it would need to be a substance that left no sign at the post mortem, so no indications at the post mortem and would not be detected by our analysis.

Q. How rare would such a substance be in your view?

A. It is not possible to say because we are not aware or we don't have access to the information to say what might be out there and what might be used.

Q. How often in your career have you come across someone who is said to have been poisoned but you simply can't find anything positive?

A. I couldn't actually say because quite often cases come in and it is suspected for example to be a drug overdose and we don't find anything. I couldn't possibly say how many cases have been analysed and we haven't detected anything.

Q. In Mr Perepilichnyy's case you looked, did you say in your first statement, at samples of blood and urine, one plain and one preserved. Could you just describe the difference between the two and why it has to be in that form?

A. Yes. The preserved sample contains sodium fluoride and potassium oxalate, sodium fluoride is the preservative so that microorganisms don't alter any alcohol that's present in the sample. The oxalate is an anticoagulant, so stops the blood from coagulating.

Then generally a plain sample is taken because most drugs are easily analysed in plain blood, you don't need preserved blood. Generally a plain and a preserved blood sample is taken. It is the same for the urine,

except urine only needs the preservative, only needs the sodium fluoride, doesn't need the anticoagulant.
Q. In your first statement, I am going to ask you just a few questions just to clarify it, do you have it still open, page 162?
A. Yes, I do, yes.
Q. You undertook a whole range of tests, looking for opioids, alcohol, stimulants and other kinds of drugs, the standard set of tests initially?
A. Yes, it was a little bit wider in that it did a test for chemically basic drugs, which is capable of testing medications as well as drugs of abuse.
Q. Your findings were in the main no abnormal substances, or amounts of substances. You did find alcohol and caffeine?
A. Yes, there was a little bit of alcohol in both the blood and the urine and caffeine in the blood. The urine wasn't analysed for caffeine, just the blood.
Q. As far as your conclusions are concerned, you can see those on page 166, you concluded that he hadn't been intoxicated notwithstanding the finding of alcohol, so you ruled that out as being a toxic finding?
A. Yes. Alcohol can be produced in samples on storage after death and it is entirely likely that the low levels of alcohol in the blood and urine could have been

produced post mortem. Even if they were the remains from alcohol consumed, they were absolutely minimal amounts and he would not have been intoxicated.
Q. You did originally find that the possible presence of an amphetamine related substance but confirmatory tests were negative. Can you explain how that occurred?
A. Yes, we do an initial screening test for amphetamines but it is not specific and it is well known that body break down products produced after death interfere with this substance. So from post mortem samples we quite often get a positive result from the screening test, which later turns out to be post mortem production products.
We do the further confirmatory test and only if that confirms the presence of amphetamine is that a positive result. In this case it confirmed that no amphetamine or amphetamine type substances were present and therefore it is a false positive result from the screening test, no amphetamine or amphetamine substances were present.
Q. You have already mentioned that you don't test for chemical warfare agent, you also I don't think test for plant poisons do you?
A. No, we do have a test for a few plant poisons but it is specifically for the ones that we have been targeting in

the past. It is not a very wide screening plant poison test.
Q. Which plant poisons? (Pause)
A. So it covers aconitine, elandrine(?), digoxin, digitoxin and strychnine.
Q. Those are poisons which are derived from plants?
A. Some of them are, yes. Strychnine can be obtained from other sources as well.
Q. Was that a particular decision to include those or is that within the standard range?
A. Strychnine is included on our basis screen, so that would be detected in our basis screen.
The other four, the test has been designed through previous cases so in a previous case where they needed to look for that substance, that is why that is included in that test.
Q. Those came back negative by definition?
A. I didn't conduct that test in this case.
Q. In respect of any of those, is it the case that those tests could still be conducted?
A. They could be, but I understand that they were covered by Kew in their test and we advised that Kew would be able to analyse for a much wider range of substances than we were able to, so our advice was rather than us doing that test for those, that the samples would be

better analysed at Kew.
Q. You were asked to do some further analyses and that is in your second statement, which you will find under the next tab, please, tab 33.
In particular you looked for drugs such as sildenafil and analogue drugs?
A. Yes.
Q. And you did find a positive result?
A. Yes, we did.
Q. Are you able to say if you found a result that was at a level which you considered is likely to be toxic to a human being?
A. No, the test was only conducted on the urine but only a low level of sildenafil was detected in the urine. It suggested that the drug hadn't been taken shortly before death but was likely to have been taken within the last day or so, because it is a relatively quickly eliminated drug.
Q. You also looked for cyanide. What was the date that you looked for cyanide?
A. It was 3 to 4 April 2013.
Q. From your perspective, understanding the way cyanide and its associated -- it comes in different forms, doesn't it, cyanide?
A. Yes.

Q. Or it can do, at least?
A. Yes.
Q. Even had it been present, were you likely to have found it at that stage, given the timing?
A. Cyanide can be degraded very quickly in body samples after death and it can be produced after death as well. So unless the samples are analysed very shortly after death, then it can be quite difficult to interpret the results.
Q. In order to be confident, how swiftly do you need to test for cyanide?
A. It would be nice to analyse it within a few days of death.
Q. Your testing six months or so after the death, five months, didn't result in any finding of cyanide?
A. No, the test was negative.
Q. You also looked for beta-hydroxybutyrate, what is that?
A. If somebody is diabetic or they drink a lot of alcohol, they can have a carbohydrate deficiency and the body produces acetone in the body and they go into a state called acidosis. BHB is the main ketone that is produced, as well as acetone, and it is an indicator of ketoacidosis, so BHB is a test for ketoacidosis.
Q. What was your conclusion in respect of that?
A. The levels of BHB were normal. They were within the

range that you would expect within the normal population, so there was no evidence of acidosis, ketoacidosis.
Q. You did some further analysis of the urine samples which are mentioned in your third statement, underneath the next tab, please. In summary, you didn't find anything else in those samples that hadn't been previously identified and in particular you did find sildenafil and its metabolites?
A. That's correct, yes, but nothing else was detected.
Q. Could you just summarise what you had expanded to look at or what specifically you were looking at in that final batch of testing?
A. Yes, this is an additional test that is capable of looking for a wide range of substances. We particularly use it to look for synthetic cannabinoids, or "spice", or new psychoactive substances but also a much wider range of medications that we have previously covered.
In addition to that, it is capable of looking for anything that might be of significance in a sample and determine the molecular weight of that sample accurately, which can give you the chemical formula and by that work out what is present, so it looks for a wide range of substances but could also look for anything that was present in the sample, of an organic nature.

Q. Could you clarify how that in fact occurs. You are looking for specific things, as you mentioned, psychoactive drugs for example --
A. Yes.
Q. -- does it simply identify that there is a spike in the sample result and then you look at the reason for that spike in more detail and try and correlate it with known substances?
A. Yes, it compares it to everything on the database, first of all, and then can look at anything, any spike of significance and see whether that is of interest.
Q. Did you find any such spikes of significance?
A. No.
Q. We know from the testing done at Kew that they did find a compound which they hadn't been able to identify, at least that is the basis at the moment of the written evidence for clarification as you probably know by the experts themselves?
A. Yes.
Q. Did you find that substance?
A. No. It is not clear whether it would have been detected by the two different tests.
Q. Is it of cause for concern or significance that that was found by Kew looking for plant material and you didn't find it looking for a broader range of substances.

A. No, I would refer Kew to answer that question because they are set up to look for plant poisons and alkaloids, whereas we are mainly looking for drugs and medications.
Q. In your final statement, the fourth statement which I think is loose, although I put it behind tab 34, you were looking for a specific drug, dapoxetine or its metabolites, and you didn't find anything?
A. No, we looked back at the analytical data. This uses the same test that is able to look for the wide range of substances and they are able to look at the molecular weight and the molecular weight of the main metabolites and see whether there was anything present in the original analytical data. And nothing was seen.
Q. Can I turn to the issues raised in the joint statement of your meeting with Professor Ferner and Dr Rice, please.
First of all, some general points. To what extent are you qualified to talk about the physiology of poisons, ie when and how they affect the body?
A. Yes, during my training I obviously needed to know about how drugs enter the body, how they affect the body. But I am not medically qualified so I can't talk about any symptoms that they might produce, any clinical assessments of a person who might have been poisoned. But I have general awareness of how drugs might enter

the body, poisons might enter the body and how they might affect the different areas of the body.

Q. Are you content to answer questions about those sorts of issues or would you defer to the expertise of the physicians?

A. I can answer certain questions generally, but if there is anything that I cannot answer I will let you know but anything of a clinical assessment would need to be answered by somebody with a medical qualification.

Q. Thank you.

The joint statement is in bundle 3, I don't know if you have a loose leaf copy of your own. If you do, please do refer to that, but otherwise for reference it is at bundle 3, tab 98, page 877 and following.

A. Yes.

Q. Page 4, please, it is the numbering on the bottom, in the middle, so the internal numbering, the administration of and timing in Mr Perepilichnyy's case. You agree at paragraph 11A that on the balance of probabilities the evidence you have seen is against a cumulative poison.

Are you able to talk about that conclusion or at least explain the basis for that from your perspective?

A. Most drugs and poisons will enter the body and have an affect once they are absorbed into the bloodstream

and then the body eliminates them at various rates, so they are eliminated very quickly. There are some drugs that can accumulate in the body, for example heavy metals, but most drugs will have an effect fairly quickly and then be eliminated from the body. The numbers are, in terms of the wide number of substances out there, the numbers are quite small.

Q. In Mr Perepilichnyy's case, are you looking at the signs and symptoms that he showed or the absence of such signs and symptoms when taking a view about whether or not he had been poisoned over a long period of time?

A. For some of it, yes, so for things like insulin but also on the range of analytical tests that was conducted, both at my own laboratory and other laboratories.

Q. You rule out particular poisons, arsenic for example is one that it has been heard of being given over a long period of time which can have a cumulative effect, that has been ruled out?

A. I understand that arsenic was tested for at Reading, so that would have been --

Q. Which Dr Branch will talk about?

A. Yes, so he could answer.

Q. Dr Black, I am sorry.

Delayed action poisons, from your perspective what kind of poisons can have a delayed action and why is

that action delayed?

A. Well, there are two types of formulation that are commonly used for medications and one is an instant release preparation and the other is a slowed release preparation. For example, morphine comes in two formulations you can either take it as oramorph, which is an oral morphine solution or that will have an effect straightaway, or you can take it in the delayed formulation, which is designed to release the drug slowly over a period of time, so that you only need to take the tablets once every 12 hours for example but it will give you a continued dose of morphine over those 12 hours.

Q. Can you get poisons or medication which is not slowly released but suddenly released on a delayed basis?

A. I am not aware of any myself but it would probably be best to ask, for example, a pharmacist or a clinician if they are aware of any of those medications.

Q. You say later in the joint statement that you cannot eliminate a fast-acting poison, in Mr Perepilichnyy's case?

A. Yes, if there was a very fast acting drug that found its way into the blood but was not metabolised into the urine and would only have been detected by the tests that we carried out in the urine and not in the blood,

I cannot exclude that a very fast-acting poison had been present.

Q. Does that include something like cyanide?

A. Yes, cyanide doesn't reach the urine but the test for cyanide was carried out on the blood, albeit several months later.

Q. When you would not necessarily expect it to be present?

A. Yes, I cannot rule out that it has not degraded over that time, yes.

Q. In the joint statement there is a lot of expression about possibilities. That may be as high as you can get when it comes to your judgment, but obviously this court, if it can, is concerned with on the balance of probabilities or even beyond reasonable doubt when it comes to murder or killing.

A. Yes.

Q. Can you say in respect of cyanide whether after six months or five months or so you would still think it likely, if he had been poisoned with cyanide, to have found it or not?

A. I can't, no.

Q. The testing that was conducted was based on the samples you were given, the urine and the blood which you have described?

A. Yes.

Q. In your joint statement and indeed in your addendum you do express some reservations about the quantity and quality. Could you just give us an idea about the limits of those aspects.

First of all the quantity, did you feel you had enough to do the tests which you were capable of doing?

A. The samples were sufficient for a standard toxicology examination. We recommend that at least 10 mils of blood is taken and there was 5 mils in one blood sample and 9 mils in the other blood sample.

The urine was small, there was only 3 mils in one sample and 3.5 mils in the other, but there could be a reason for that, for example very little urine present in the bladder at the post mortem. Sometimes we do get very small urine samples but generally they are about 20 millilitres, they come in pots that are about 20 millilitres for a plain urine sample.

The urine was a small sample but we were able to do all the tests that we were asked to do on the blood and urine. We were asked to use the minimum amount of sample to save samples for possible future tests so we had that in mind when we were doing our tests, but we were able to do all the tests that we were asked to do on the samples, although we did recommend that it would be better for some of the tests to be conducted

elsewhere, for example Kew, because they could cover a much wider range of substances than we would, so we didn't want to use up a small amount of sample only testing for a few substances if there was a better test that could be conducted elsewhere.

Q. That is the quantity. What about the quality of it, including the effect of the preservation that was carried out?

A. The samples did not look unusual, they were in preserved containers. The blood and the urine each one of those was each in a preserved container, so they were sufficient for a toxicology examination.

Q. In the joint statement, I think Professor Ferner and Dr Rice agree that from the documents provided to us it appears that some samples were of poor quality, for example there was apparent dilution of one of the urine samples and there were uncertainties regarding the stomach contents. Is that something which -- you have not as it were added your view to that. Is that your view from your perspective or is that really from their side?

A. The urine samples were not diluted when they were received by ourselves and they were not diluted while they were analysed by LGC. But then they were collected by Surrey/Sussex Police and taken elsewhere for

analysis. They were not diluted before they arrived at LGC and they were not diluted while they were at LGC. They were normal urine samples when they were received at LGC.

Q. To summarise from your perspective, the quantity and quality of the samples were satisfactory in order to conduct the tests you were asked to conduct?

A. Yes, we would obviously have liked more urine because we would like at least 10 millilitres and quite often you get 20 millilitres, but if there is only a small amount of urine available at the post mortem we have to work with whatever is available. But we were able to do alcohol drugs screen and the test at HFL on the amount of urine that was present and there was still some left over after our analysis.

Q. The passage of time, cyanide we have already touched upon in terms of your testing the blood samples and your expectation about that. What about azides, if I am pronouncing that correctly?

A. Yes. No we don't think we are able to detect azides, we have looked for azides in the past so we don't think that they would be covered by any of the tests.

Q. Your tests wouldn't --

A. Wouldn't cover azides.

Q. Are you able to carry out tests for --

A. No.

Q. Who would test for those?

A. I don't know.

Q. As far as you are aware, do azides need to be tested within a certain period of time, like cyanide?

A. I am not particularly familiar with azides because we don't test for azides. I wouldn't be able to comment without consulting the literature.

Q. A point made in the joint statement is that some toxins only have been revealed in the blood and the urine after specific tests looking for them. Azides I think would fall into that category of you need to go looking for it?

A. You need a specific test for it, yes. It is not a test that would -- azides would not be detected by general screening methods.

Q. What kind of poisons will not manifest themselves at all in urine?

A. Cyanide, for one. Volatile substances.

Q. Such as?

A. Things like toluene.

Q. What is --

A. Any solvents.

Q. Solvents?

A. Yes.

Q. These are substances which break down very swiftly before they even get processed by the body into the urine?
A. Yes, they are not eliminated via the urine mainly. Most solvents are eliminated through the breath and via the blood, they are not eliminated through the urine.
Q. On the question of whether or not Mr Perepilichnyy was poisoned, there were a large range of poisons, or potential poisons, which you did test and which you have safely eliminated as I understand it, opioids for example, acetone?
A. Yes, acetone and some of the other volatile substances, actually toluene would have been detected by our alcohol test, so that wasn't a very good example to give. Some volatile substances, such as acetone, are detected by our alcohol screen.
Q. Are there any other obvious poisons which have been conclusively ruled out from your perspective?
A. Anything that is covered by the tests that we have covered, so drugs of abuse, medications, things like strychnine and other plant poisons that are covered by the tests, either by our basic screen or by the work conducted by HFL.
Q. There are some potential poisons that cannot now be eliminated because the passage of time or the quality

and preservation of the samples renders it impossible, so for example cyanide is one?
A. Yes.
Q. Cannot now be eliminated?
A. Yes.
Q. Azides, you defer to others I think when it comes to whether or not that could be tested?
A. Yes.
Q. Phosphides is that another area where you defer?
A. Yes.
Q. Organophosphates, comparable to phosphides?
A. Yes, they would be better detected by a specific test, some of them may be detected by the tests conducted at HFL and by our basic screen, but it would be better for a specific test to cover all organic phosphates to have been conducted.
Q. That is presumably is a question to direct towards someone like Dr Rice or Professor Ferner, is it?
A. Yes, because there were discussion about which substances you would be able to rule out from the symptoms or likely to be ruled out from the symptoms. Bearing in mind the possible limited amount of sample.
Q. Thank you.
The unknown compound you have already touched upon, this is the compound found by Dr Kite. Can you say

whether or not it could be a toxin or not?
A. No. I was asked if I could help with that, I asked the person that conducts the analysis at HFL if he had any ideas. He put it into his system and again he came up with the same compound, but that was just literally matching the molecular weight.
Q. Does that feature in any of your written evidence?
A. No, no, it doesn't, but that is not -- that doesn't add anything, that was just a backup. After Kew had produced their report the police asked us whether we would be able to help and he said well it comes up for this compound, but he is not able to add anything further.
Q. It cannot be eliminated as a toxin, from your perspective?
A. No, it is one possibility for that result.
Q. Again, going back to probabilities --
A. Yes.
Q. -- can one apply a probability analysis to an unknown compound being found in a gentleman that has eaten or said to have eaten just before running?
A. No, I would defer to somebody who is experienced in testing for plant alkaloids. So I would say that somebody that has experience in testing for plant alkaloid is better giving an opinion on whether that is

consistent with somebody having taken that poison or not.
Q. Your overall conclusions jointly, towards the end of your statement around page 30 onwards. Again, I would quite like to be clear if you are effectively agreeing with Professor Ferner and Dr Rice about these issues, or if you have your own views and bring your own expertise to bear on it. Your conclusions at paragraph 81, which actually starts on page 29 but the substance of it is on page 30, there is a large number of poisons available to a determined assassin?
A. Yes. I would agree with that.
Q. A very large number?
A. Yes.
Q. What, just to understand how you can have an opinion on that, can you explain how you form that view?
A. There are drugs of abuse, various medications if given in large doses can kill somebody, there are a large number of plant or alkaloids, animal poisons, there are a large number of substances. Some are obviously more easily available than others. But yes, there are a large number of potential poisons.
Q. Things like cyanide or organophosphates can be accessed by the public without too much difficulty, in different forms?

A. I understand they can, yes.
Q. Some poisons will be rare or will be specially made?
A. Yes, certainly some poisons will be rare. With regard to being "specially made", I take that to be whether they could be designed as a chemical warfare agent, for example or similar. I would defer to people with that experience to comment on that.
Q. Does the phrase chemical warfare include targeted assassination for these purposes?
A. Yes.
Q. Just to clarify, can you give examples of the rarer type of poison?
A. Well, a lot depends on whether people have access to them, so how easily they can get hold of a plant poison for example, it might be very easy if they have it growing in their garden, animal poisons, et cetera. It varies, it depends on what substance you are interested in.
Q. Some poisons are harder and impossible to detect even in ideal post mortem simples. We have already dealt with that to some extent, are there any other poisons from your perspective which have not been raised in the course of your testimony today which are examples of that?
A. Not that I can think of, but there may be ones that are

used, for example in chemical warfare or if somebody was an experienced assassin that could be used, that we are not aware of because we don't cover those tests, so we are not aware of those.
Q. Nerve agents, for example?
A. Sorry?
Q. Nerve agents?
A. Yes. Yes.
Q. To what extent do you defer to Professor Ferner and Dr Rice on the question of whether or not on the balance of probabilities or beyond reasonable doubt Mr Perepilichnyy was in fact poisoned?
A. Yes, I can say that none of the substances that were covered by our tests were detected, apart from sildenafil, caffeine, low levels of alcohol. I cannot say whether or not he was poisoned. It is not my experience -- it is not -- I am not -- I don't give a cause of death. I only conduct the tests for various substances and say whether or not they were present and whether they are likely to have killed somebody or caused a fatality, but I am not able to give a cause of death.
MR SKELTON: Thank you.

Questions from MR MOXON BROWNE
MR MOXON BROWNE: Dr Perry, I represent Legal & General, the insurance company.
You may have been a little bit diffident in accepting that you are a toxicologist. Can I just explore that a bit. I think you have a bachelor of science degree in chemistry?
A. I do, yes.
Q. You also have a doctorate, a PhD, and I think your thesis was on a toxicological subject, I have forgotten what it was but it was in that area, perhaps you have forgotten?
A. It was more to do with medicinal chemistry and it was --
Q. I can't hear, sorry.
A. It was to do with crosslinking in collagen and when crosslinks don't form properly it leads to certain diseases.
Q. It is not really toxicology?
A. It was not a toxicology based thesis, no.
Q. Sorry, I had misunderstood that.
At all events you have been working in the field of forensic science and toxicology since 1998 and latterly for LGC?
A. Yes.
Q. They describe themselves on their website, and since it

is only a website we must get you to confirm the truth of it, they are, "A world leader in forensic science and the UK's [you assert quite bluntly on your website] leading full service forensic provider".
A. Yes.
Q. Is that right or is that just a puff?
A. Well, we have various departments, so in quite a few areas of forensic science, not just toxicology we also do DNA analysis for example. Yes, we are regarded as world experts in some areas and we do the most amount of work for the police in the UK --
Q. Yes.
A. -- as far as toxicology goes.
Q. I want to get, if I may, an understanding of your actual function. I am just going to ask you if I may quite bluntly, are you someone who wears a white coat and fills up test tubes and things or do you wear a white coat and supervise other people doing that or do you sit in an office with a computer and direct operations from a fairly high level, if I can put it crudely?
A. Yes, I am a reporting officer, so I assess the cases, decide what tests need to be carried out and write the reports. I do not carry out the analytical work myself. That is conducted by well trained analysts using standard operating procedures.

Q. Yes. There is no suggestion whatever that this was not done properly. Let me make that clear.

I take it that an organisation like yours would be perfectly capable of, for example, being given a matrix of digestive contents or contents said to come from the digestive tract and picking out of that, putting it into a solution and picking out of it with a pair of forceps what it was you were interested in. That is the kind of thing you can do?

A. We certainly do analyse stomach contents for drugs and medicines. Not very often, we mainly analyse blood and urine.

Q. Yes.

A. If blood and urine give sufficient information, then we will not analyse the stomach contents. And we don't look for stomach contents themselves, so we don't identify either food matter or plant material in stomach contents. We would send that elsewhere for that to be done, if it needed to be done.

Q. I understand.

I think you do have the capacity to do liquid chromatography, mass spectrometry analysis?

A. Yes.

Q. Indeed you did that in relation to the early work you did, you used those techniques?

A. HFL used those techniques.

Q. I know they did, but I am putting to you that according to the information you provided, you also used some of those techniques in relation to your earlier studies, perhaps we can come to it in a minute if you don't remember that?

A. I think the sildenafil tests uses LCMS. Yes.

Q. I think there may have been others, but we will see in a moment. Most of that work was done at HFL?

A. Yes.

Q. They are essentially a sports science agency which your company acquired a few years ago and are now part of your organisation, correct?

A. Yes, they were formerly a horse racing forensic laboratory.

Q. Yes. They are located near Newmarket, for obvious reasons?

A. Yes.

Q. You as it were, I won't say sub-contracted but you sent off the third stage of the study or the last stage of the study to them?

A. Yes.

Q. I am just wondering why that was, they are basically people who look at animal doping and sometimes human doping in sports situations. Why did you do that, why

didn't you do it yourself?

A. Because we didn't have the technology at that time. We didn't have the high resolution liquid chromatography mass spectrometry and they, with their work for horse racing and other sports, they are looking for unknowns, because you can get anything used as an adulterant in sports science. Their technique is designed to look for anything in a sample.

Q. We will come to the efficiency or otherwise of that technique, perhaps a little later.

Are you yourself familiar with the rather technical area of mass spectrometry, the principles of it, how it works?

A. I am familiar with the principles of it, yes. I don't conduct the tests myself.

Q. You would obviously defer to people like Dr Kite and perhaps Professor Simmonds as far as that area is concerned?

A. I would, yes.

Q. Yes.

I think that your instructions usually come from the police via a document called MG21?

A. Yes.

Q. That tells you what it is that they want you to do?

A. Yes.

Q. We haven't actually seen, I don't think, the relevant MG21s in this case but that perhaps doesn't matter because you have made it quite clear what it was you were asked to do.

Did you understand that there was a forensic strategy in place here, that someone had an idea, a strategy, of how to set about the relevant toxicology or did you get the impression it was just fairly random instructions?

A. No, they gave clear instructions on the MG21 of the initial test they wanted. But the police are always open to advice from ourselves as to whether those tests are relevant or not. If there are other tests we think are relevant, we will discuss it with them.

Also, I was aware that the police were meeting with the pathologist and other representatives to try and devise a list of samples and I certainly had a conversation with them along the lines of:

"We don't have a test for poisons, there isn't a test for poisons, it will take a lot of tests and it will use up a lot of the sample so it would be best if we could have a list of the most relevant tests that you want us to conduct. We can tell you whether we can do that or advise you if there is a better place to send the samples to."

It is a discussion between the police and ourselves as the analysis goes on.
Q. I think I understand perfectly what you are saying. But can you identify for me who the strategist was. Who was in charge of this?
A. Yes, the main person that I was dealing with was the SOCO, which was SOCO Nick Craggs, so most of my telephone conversations and discussions were with SOCO Nick Craggs.
Q. With Mr Craggs?
A. Yes.
Q. When you said, "I think the plant testing ought to be done at Kew", it would have been to Mr Craggs that you said that?
A. Yes.
Q. We haven't seen any documentation or exchanges about that, was it by email or telephone?
A. It was certainly by phone, which is in my minutes and some of it would have been by email as well, yes.
Q. Yes, so there was contact?
A. Yes.
Q. I think that it is right that your laboratory is UCAS accredited?
A. It is, yes.
Q. That is a very valuable accreditation, isn't it, it is

difficult to maintain, it is expensive to maintain, and it is very important in the provision of your services?
A. It is, yes.
Q. Do you have yourself involvement with that, as someone that I gather has a managerial function?
A. No, I am not one of the main people that are involved in it. There are spot checks, so they can come into the laboratory at any time and do a spot check and ask you questions. They can ask to see your training records, for example.
But no, I am not involved in the preparation or in the discussions when UCAS come to the laboratory.
Q. I think there are many many features of accreditation --
A. Yes.
Q. -- but I think two are perhaps particularly important, can you confirm.
One is to ensure that your equipment is functioning in a consistent way?
A. Yes.
Q. Are you familiar with the expression "Shewhart controls"?
A. No.
Q. No, but at all events you have regular checks to make sure that your equipment is performing in a consistent way?

A. Yes. Yes, we do.
Q. Yes. I think it is also very important that you use validated methodology in your search for substances, in other words that you can demonstrate that you have done this before and it works?
A. Yes.
Q. Indeed both you and separately HFL publish lists of what you are accredited to do and what you are not?
A. Yes, or if you were looking for a new substance for example, you would try and obtain a standard for that sample and put it through your method at a certain concentration and show that you could detect it.
Q. Yes.
You are familiar with the concept, as of course the learned coroner is, of the chain of custody, the importance of maintaining the integrity of the samples as they go through?
A. Yes.
Q. That is something which is itself the subject of quite elaborate protocols?
A. Yes, it is fundamental to forensics, yes.
Q. Indeed in a criminal case, if you didn't have your chain of custody in order the evidence might well be rejected or ...
A. Absolutely, yes.

Q. Yes.
I just want to ask you about a couple of examples which seem to have happened in this case. There was mention by Mr Skelton of the dilution of a particular sample of urine. I think the evidence will show, I don't know whether you know this, that as well as being diluted by 10 times, there was also nitric acid added to it, so it was essentially a rather weak solution of nitric acid, the person who did that it was an aliquot that he had taken from an evidence bag, he used it for his purposes with the nitric acid and then put that back in the evidence bag with the original sample and sent it on to somebody else without saying what he had done.
Can you just comment on that as a matter of practice?
A. Yes, I got that impression from reading some of the papers in the document that that is what happened.
Q. The coroner will hear evidence about it, but just assume that happened.
A. It is obviously best to take an aliquot from a sample if you are going to treat it with anything and not treat the original sample.
Q. No, it is a question of putting it into the evidence bag, which had originally contained just one tube, now

has two but nothing written on it.
A. If that is documented in the records and it is clearly labelled as being a diluted sample and what has happened to it, then I would think that was okay. As long as anybody who is analysing it afterwards is given details of what the original sample looked like, what the additional aliquot was and what had happened to it --
Q. I wanted to look at that.
A. -- that is the information that would need to be provided.
Q. Of course.
A. Yes.
Q. Let's just look at it from the other end, the recipient, there are also protocols are there not, quite strict, about what you do if you receive a sample that doesn't seem to accord, isn't labelled properly or doesn't seem to accord with what you are supposed to be receiving. There are particular things you need to do in that situation?
A. Well, the advice at our laboratory is it that you would discuss it with the person who had submitted it, so whether there was an explanation for why there was a difference to how you were expecting the sample -- sorry, I was going to say if for example you receive a sample that has been previously opened and resealed,

you would need to know who had previously opened and resealed it. It might be that it was originally analysed for DNA or it was analysed by another laboratory before it came to you.
Our advice is that you would not analyse the sample until you found out where that sample had been and whether the continuity was in place and that you knew which was the original sample.
Q. I am sure that is very good advice.
What I was putting to you was that in order to achieve accreditation, as you have, that you have protocols that lay down that if you receive a sample that doesn't look right, has the wrong label on or contains obviously the wrong substance, that there are things you should do, you shouldn't just go ahead and analyse it without saying anything?
A. Yes, we certainly do at our laboratory, yes, we certainly do.
Q. You are not aware that in doing so you are abiding by a protocol?
A. No, I know I am abiding by the protocol and I know I have to do it, yes, but I can only comment on what we do at our laboratory.
Q. I think again the coroner is going to hear evidence in this case that when the digestive tract was sampled,

that the solid vegetable material was put into different jars and were then put in a fridge where they remained for a number of years, they were forgotten about. Is that something that could happen in an accredited laboratory?
A. Yes, they could be stored, either refrigerated or frozen.
Q. No, forgotten about for three or four years?
A. I can't comment on that.
Q. Very well.
As far as the work done at LGC is concerned, I think we see a nice summary which may be convenient for the coroner rather than looking at the individual detailed reports, give a summary in bundle 3.1 at page 181, if you would be kind enough to try to find that.
A. Sorry, which bundle am I looking in?
Q. You are looking at bundle 3.1, which is probably written in minute writing on the spine.
This is the first of three toxicological bundles that we were given.
A. Do you have a page number?
Q. Yes, 181, which you will find in the top right-hand corner, called, "Forensic examination record, schedule of testing" in someone's handwriting, possibly yours.
A. It is this one.

Q. In case there is any confusion, as I understand it, the medical evidence was put together in three volumes for the use of experts at their joint meetings and I had understood that the court was going to use those bundles in preference to the ones previously prepared. In my case they are numbered 3.1, 3.2, and 3.3.
THE CORONER: I have 3.1, but it doesn't seem to have 181 in it.
A. It is in file 1 in my copy and 36 --
MR SKELTON: It is the first file 1, tab 36, page 181.
A. Yes.
MR MOXON BROWNE: I am sorry if I have caused difficulty, I was trying to do as I was told.
THE CORONER: Don't worry.
MR MOXON BROWNE: That is the one.
The reason why I am looking at this is because on two sheets of paper we seem to have a nice summary of what you did and when you did it. Is that a fair description of this document?
A. Yes.
Q. Is that your writing at the top, "Schedule of testing"?
A. No.
Q. No, doesn't matter.
This shows us I think that on 6 December, that is to say getting on for a month after Mr Perepilichnyy's

death, you were given a request to carry out tests. That is probably a reference, is it, to a MG21?
A. Yes, that is when the samples and the MG21 was received by LGC.
Q. Yes, and it records I think that between 7 and 10 December there was the analysis for alcohol, carried out by Headspace?
A. Yes.
Q. Then there was, on 7 December, screening for seven classes of drugs of abuse by Silvia Lombardo?
A. Yes.
Q. Then the amphetamine analysis, and I took that to be a combination of gas chromatography and mass spectrometry and chromatography, that is why I suggested you had used that technique.
A. No it is GCMS, so it is gas chromatography, mass spectrometry, the liquid part is extracting from the samples --
Q. It is my fault, I misunderstood.
Then, again at the same time, the analysis for chemically basic drugs by liquid extraction and gas chromatography mass spectrometry. That is what you have described as the basic drugs of abuse?
A. And medicines, yes.
Q. Then on 25/26 March, someone called Karly Withers did

an analysis for what I will describe as a prescription drug, you needn't say what one it was?
A. For sildenafil, yes.
Q. Yes. I did say --
A. Sorry, I thought you said ... sorry. Yes, that's correct.
Q. Yes. By the time we have got to March, that is November, December, January, February, March, six months after Mr Perepilichnyy's passing, you had looked for alcohol, you had looked for common drugs of abuse, and you had looked for specifically that prescription drug. Correct?
A. Yes.
Q. Did anybody ever ask you at any stage to give advice as to what Mr Perepilichnyy might have had for lunch on the day of his death, was that ever raised?
A. No, and we would not be able to help with that inquiry.
Q. If they had said that you would have sent them somewhere else?
A. Yes, we don't look at stomach content for food contents.
Q. Then, I think on 3 April, you did the analysis for cyanide. We are now getting five or six months after the death and although you said in answer to questions earlier that that had come back negative, I think the position now is that you have agreed with

Professor Ferner and Dr Rice that that cyanide test cannot be relied on because it is simply too old?
A. No, the test result itself is negative, but as I said in my statement, the interpretation is not conclusive, so it is the interpretation that is inconclusive, because we cannot say whether there was cyanide present that has degraded over the period of storage.
Q. There are two things about cyanide.
One is it requires a lot of material to analyse, it eats up your sample, doesn't it?
A. It does for our test, yes.
Q. Secondly, it is known to degrade quickly, so -- and I think by the time you reach this stage, all the preserved blood had gone, so you had to use only fresh blood?
A. We didn't have sufficient preserved blood to do the test, because it uses a large volume, so we had to use the unpreserved sample. Yes, we would have preferred to have done it on the preserved sample because the preservative can protect the cyanide and help prevent it from degrading.
Q. Of course, so that is a very good example of a way in which your work was hampered I would suggest in terms of its reliability by an unexplained passage of time?
A. Yes.

Q. I mean the position we have is that nobody looked for cyanide until getting on for six months after the death and by that time the result couldn't be relied on, that is where we are?
A. Yes.
Q. Then, and we are now at 14 May through to 3 June, you send off to HFL --
A. Yes.
Q. -- the place near Newmarket where they do the sports work --
A. Yes.
Q. -- for a general screen?
A. Yes.
Q. You have described rather, if I may say so, slightly sweepingly that this is a sort of catch all test that can find -- I think you call them unknown substances?
A. 1not a catch all, but it does look for and cover a much wider range of substances than we had done in our initial test and is capable of detecting unknown substances present in the sample.
Q. Yes. First of all, this is not a validated technique, is it?
A. It is not, it falls outside the UCAS accreditation, yes. It is internally validated but doesn't come under the UCAS accreditation.

Q. Yes.
Secondly it is not a targeted test, it is the opposite of a targeted test?
A. Yes.
Yes.
It is targeted in the way that they have a database of substances of molecular weight so they compare that to every single sample, but it goes further than that into being an untargeted test, yes.
Q. I think it is right that at that point, HFL did not pick up the unidentified ion that just before this had been identified at Kew?
A. No.
Q. They didn't pick it up at this point?
A. No.
Q. I think you have told us, it is not something which is dealt with in any of your reports, that is fine. It is evidenced elsewhere, that after Kew had drawn a bit of a blank on what this substance might be, that it was sent at the request of Surrey Police to you, and I think in turn you sent it to HFL to see what they might have to say about it?
A. Yes.
Q. I think you are saying that a further test was then carried out at HFL, targeted for this particular

unidentified ion, which this time they did locate?
A. No, no further analysis was carried out. All that was sent on was the information from the report from Kew with the molecular weight, and they were asked whether they could provide any information as to what it might be and so the molecular weight was put into the database --
Q. Yes.
A. -- and it came up with the same compound that had been suggested by Kew --
Q. Yes.
A. -- and another medication that had a close, close, molecular weight.
But no further analysis was done and we advised that we wouldn't be able to help any further and that somebody who was an expert in plant alkaloids would be better giving advice as to whether that was an expected result if somebody had been given that poison or not.
Q. Yes. I thought that what you said had happened, but I thought from your evidence a moment ago that you had said they had done as it were a fresh test but all they did was to see whether the work they had already done revealed this particular compound?
A. No, they didn't even do that. They used their analytical equipment to look at the molecular weight.

MR MOXON BROWNE: Sir, it has been suggested to me that it might be time for a break.
THE CORONER: Certainly.
All right, just be careful whilst you are in the middle of your evidence not to talk to anybody about it.
A. Absolutely.
(11.32 am)
(A short adjournment)
(11.47 pm)
THE CORONER: Mr Moxon Browne, can you just give me an idea, just because we have been looking at what lies ahead and we have got a lot on --
MR MOXON BROWNE: Yes.
THE CORONER: -- how long you are going to be?
MR MOXON BROWNE: With this witness?
THE CORONER: Yes.
MR MOXON BROWNE: About 10/15 minutes.
THE CORONER: All right. Will you just remember what I said about starting with the most important things, it has to add to -- if we are on to some poisons haven't been tested for and some you couldn't find, that is pretty well trodden ground I think.
MR MOXON BROWNE: Yes. We also have obviously an excellent agreement, to which other witnesses have been party, so perhaps --

THE CORONER: I am not being critical it is just we have a lot in particular today and we just mustn't lose sight of it, I am not saying any more than that. If you could keep that in mind I would be grateful.
MR MOXON BROWNE: Yes.
Dr Perry, if you just summarise where you had got to after six months of work?
A. Sorry to interrupt, but may I make a correction before we carry on. I said that HFL didn't look for the same substance in their analytical data.
Q. Yes.
A. I have just found an email saying that he did look at the data, so he didn't do any further analysis but he looked at his data from the urine sample for anything with a mass of 359.19647, which was the unknown that was found in the stomach contents by Kew in their original analysis.
Q. Yes.
A. He didn't see anything with that observed mass in the urine, but it is important to stress that the information from Kew was from the stomach contents and HFL are looking at the urine there.
Q. Yes.
A. He looked at that data from the original Kew analysis but not anything from the later analysis that was

carried out at Kew regarding the urines.
Q. If it assists the coroner, of course Kew didn't find this substance in the urine either, or at least there is a big question mark as to whether what they found was. So that is entirely consistent with what came out.
A. Okay.
Q. That is no criticism of the work that was done by HFL. Thank you.
If we just summarise where we have got to at the end of this six months odd work, I don't think any targeted tests were done for any cardiac glycosides, save to the extent they might have been present incidentally in plants?
A. Yes, again we advised that that would be better covered by Kew.
Q. Yes.
I think it follows from that that there were no tests done for plant poisons, apart from possibly incidentally?
A. Yes, just the ones that might turn up at HFL.
Q. Like strychnine?
A. Yes. Strychnine would also be covered by our basic test that we carried out on the blood.
Q. Yes.
No tests for any chemical warfare agents or

assassination agents such as sarin, tabun, the G series, the V series, the type of thing that is said to have been killed Kim Il-Jong, no tests for that at all?
A. No.
Q. Nor, as far as you know, done at Porton Down or anywhere else?
A. No, we advise for Porton Down to be consulted if anything of that nature is of interest.
Q. Yes. Then we have the expert's agreement and I am not going to take you through it because we are under pressure of time, the coroner has it and there are other witnesses who may deal with this.
Save to pick up perhaps one or two special points, that you have made yourself. Could you please look at the agreed answer 28, this relates to the question:
"Would any unknown substances still present in the urine have been detected by these tests or insofar as you consider it relevant in the tests at Kew were any unknown substances detected?"
Then the answer is given, that is the third answer:
"We agree that Kew reported a mass ion at MZ 359, later revised to 180, that remains unidentified".
Do you agree that in fact what Dr Kite is reporting is that the revision to 180 is something which he has arrived at as a matter of probability only, whereas

Professor Cowan, who is rather more skeptical, refers to it as just a possibility. It is not really a revision, it is just a different idea has been introduced. Do you agree with that?
A. I am only aware of that information from the reports produced by the people mentioned, it is out of my expertise because it needs an expert in chromatography.
Q. Very well, I just place that marker that to say it has been revised might be a bit of an overstatement.
A. Yes.
Q. Answer 41, which I think is rather squarely within your expertise:
"Do you have any concerns in relation to the reliability of the toxicology testing in this case, if so please identify?"
You say:
"We agree, from what we know or have read, that the testing at LGC and HFL was conducted to UCAS standards."
That of course is entirely uncontroversial but the same could not be said, could it of the testing carried out at either Reading or Kew, neither of which are accredited institutions, although no doubt excellent in their own ways?
A. Yes.
Q. Yes, then under their rubric "Toxic alkaloids derived

from gelsemium", questions starting at 72, do you have that?
A. Nearly.
Q. I am afraid I do not have a page --
THE CORONER: Page 24?
A. Yes, thank you.
MR MOXON BROWNE: Thank you.
The question is:
"What are the signs and symptoms of poisoning with toxic alkaloids derived from gelsemium?"
You have joined in this answer which includes, and the third line "Respiratory depression, dilated pupils", do you see that?
A. Yes.
Q. Then over the page:
"Were the signs and symptoms consistent with poisoning?"
The agreed answer, to which you were a party, was:
"Based on our reading of the medical literature, we agree the deceased had reduced body temperature, shallow breathing et cetera dilated pupils are not mentioned."
It has emerged in the course of the evidence from the ambulance men, the paramedics, that in fact the pupils were recorded as dilated. Does that affect your view in any way?

A. No, it doesn't. My input into this would be reading what the medical literature describes as the symptoms --
Q. Yes.
A. -- and not from comparing the clinical signs to this case, so that would be mainly for the others to comment on but I am not going to disagree with them because as far as my expertise goes I am not in disagreement with them.
Q. Yes.
You are obviously aware, you have said so, that it is the view of the Dr Kite that on the balance of probabilities, the so-called unidentified ion might well be two smaller ions stuck together, so instead of being one big toffee, two smaller toffees, two smaller identical toffees stuck together. You are aware of what I am talking about?
A. I am aware of that from reading his report, yes, but it is not within my --
THE CORONER: That is not within your expertise?
A. No, that would require an expert on chromatography.
MR MOXON BROWNE: My question is I think within your expertise.
THE CORONER: She said no, is that right?
A. I am only aware of it because I have read his report, I am not able to give an opinion on whether that is

right or not, I am only aware of it because I have read it in his report.
MR MOXON BROWNE: I think you and the other experts were provided with some material from a database called the Human Metabolome Database, and I think the suggestion is made, I think emanating from Surrey Police, that if one looked at the single toffee as opposed to the two stuck together toffees it might well be a substance called either salsolinol or maltoxaxine(?), do you remember those two words?
A. I do remember those are reading those on the list, yes.
Q. Are you familiar with the research tool Human Metabolome?
A. Only from what I have read in Dr Kite's report but I am aware that there are databases out there that will tell you the likely source of some of these compounds or the potential sources.
Q. This is quite important for the future direction we take. Were you aware that that database actually gives the data for the spectral analysis, it shows you what the spectrum looks like. It is very easy to find out if you have got as Kew had something to say is it salsolinol or not, that is not difficult to do?
A. I don't know that --
Q. Very well.

A. -- you would need an expert on chromatography to analyse that further.
Q. Yes.
Finally, sir, if I think I am on 79:
"How common would you expect it to be to find unidentified ion in an individual stomach contents post mortem?"
You say:
"We are unable to say."
That includes you?
THE CORONER: You said that earlier, didn't you?
A. Yes, well it could be that a drug that has been taken orally could have all been absorbed from the stomach or the stomach contents passed into the rest of the intestine.
MR MOXON BROWNE: That is just what I wanted to fasten on to. If it was a product of the digestive system it would be a natural substance, wouldn't it, by definition?
A. If it has been ingested as food that has been eaten or drink that has been eaten --
Q. I am talking about the possibility of the product being produced by the body itself, if that theory were advanced, one could say straight away this a natural compound?

A. Yes, sorry, yes.
Q. Therefore you would find in the dictionary?
A. Yes.
MR MOXON BROWNE: Thank you.
Thank you, sir.
Questions from MR STRAW
MR STRAW: Dr Perry, a question about the more detailed test by HFL of the urine. Is it right that substances that have been ingested may alter or degrade as they pass through the various organs of the body before they reach the urine?
A. Yes, most substances are transformed by the body into more water soluble substances so that they can be eliminated in the urine.
Q. In the six or seven-month period between the death and the test at HFL, is it possible that some toxins may have degraded or disappeared before they were tested?
A. They might have degraded but they may have degraded to something that would still be picked up by the analysis, so it depends what it degrades to. If it degrades to a closely related substance, or a substance that is on the database, something it would be transformed naturally in the body, then it may well be on the database anyway as a metabolite.
Q. Is it fair to say there are three categories, you either

find the original substance, something that it degrades into or the third category, there are some poisons which may have degraded and disappeared and therefore are not detectable by the time of the test?

A. Yes, and there is a third one, because they will be metabolised into other substances. A lot of metabolites are on the database, or you would detect it as an unknown and investigate further.

Q. I think as you put it in question 34:

"It is possible that toxin that caused death was not detectable in the urine test, either because it did not reach his urine or due to the passage of time and how the sample was stored."

A. Yes.

Q. Is that accurate?

A. Yes, that is referring to things like cyanide for example, that doesn't pass into the urine, yes.

Q. Does effectively the same apply to the blood tests? So there are some poisons which may have caused death but which may not have been detectable by the time the blood came to be tested?

A. It would be unusual for a substance that is covered by the tests to not be detected. Unless it had degraded like cyanide by the time we did the test. But for a substance to exert its effect on the body it needs to

pass into the bloodstream, so anything taken recently prior to death, you would expect to detect in the blood and/or urine.

Q. I think, as you put it in question 36E, you agreed that:

"There might have been significant degradation of a fatal toxin such as cyanide in the plain blood over the period of five months between the death and the date of testing in April 2013, such that it was not detectable on testing."

Do you adhere to that?

A. I do, yes.

Q. As I understood your evidence, you didn't test for -- this is no criticism -- all known poisons?

A. No. No, we didn't. We did advise that some tests would be better carried out by other laboratories, and we were doing it as a staged analysis so we were carrying out tests as they were requested.

Q. You mentioned to Mr Skelton a couple of specific examples, cyanide, azides, phosphides which, do I have this right, your analysis does not exclude as a possible cause of death?

A. No, we don't look for azides or phosphides. We cannot be certain that they would be detected by our tests so we would say we do not cover azides and phosphides.

Q. Likewise, organophosphorous compounds, are there some

not all but some which your tests do not exclude as a cause of death?

A. Yes, some of them may be detected by the tests at HFL or on our basic screen but again there are a lot of organophosphates and we can't say that we could detect all of them so it would be better if a test was conducted for all of them if you needed to rule them out by analysis alone.

Q. What about fentanyl derivatives, things like etorphine, carfentanil, remifentanil, are all of those entirely excluded by your tests?

A. Yes, they are. Some of them were in the database when it was originally analysed in 2013. There have been a lot more fentanyls, synthetic fentanyls that have arisen since then and I did ask after the meeting, I did ask HFL to check the analytical data for those as well. That has been done and none of them were found.

Q. The reason I ask was in the report, you have phrased it by saying that they would probably have been detected and therefore it is unlikely that they were a cause of death but it doesn't answer the slightly different question, can they be completely excluded, so is there a possibility that they were a cause of death that can be completely excluded?

A. There is the possibility that death was so rapid that it

wasn't metabolised into the urine. There may be a possibility that, and that might happen with etorphine, because it is very fastly acting.

There might be a new substance that we haven't covered, that wouldn't have been picked up. Or that it is below the detection limit, if it is mainly in the blood and not in the urine and would only be covered by HFL. There is possibilities that it wouldn't be detected, but a lot of substances would have been detected.

MR STRAW: Thank you very much.

Questions from MR BARTON

MS BARTON: Can I just be clear about the process, if I may, and I am going to pick up on one answer that you gave. You said that you would get the instructions via the MG21.

In fact, sir, it is in the bundles, it is at D27 in 5.4.

THE CORONER: Thank you.

MS BARTON: Getting the instructions you would then decide -- you would assess the evidence that was available, is that correct?

A. Yes.

Q. You would decide on what tests to carry out and then your laboratory would carry out those tests and you

would write a report?
A. Yes, we would decide on the best test to detect the substances requested. For example, if the test is for drugs of abuse, we decide the best tests to detect the drugs of abuse. For example whether you need to analyse the blood or the urine or both depending on the time interval between ingestion, et cetera, but we are guided by the police on any additional tests outside their initial remit, although we will discuss with them and suggest other tests if we think they are relevant.
Q. I am going to come back to that in a moment, because there were two particular factors in this case, weren't there? The first is that you had samples which were sufficient for standard toxicology tests in terms of size, didn't you?
A. Yes.
Q. The tests in this case went way beyond standard toxicology, didn't they?
A. They did, yes.
Q. Have you ever been involved in a case before this one where you have been involved with samples that have subsequently been sent to Kew for plant analysis and Reading for further analysis?
A. I am certainly aware of cases where samples have been sent to Kew by my colleagues.

Q. Yes.
A. I can't remember on the top of my head whether any samples have been sent on any cases that I have been involved in, because we may just advise that they arranged those analyses ourselves, so we might just return the samples to the police and the police arrange that analysis themselves.
Q. From your experience, were the toxicology tests carried out on the samples in this case extremely expensive?
A. Yes, they were.
Q. Were there discussions, as you say, about which substances you were able to rule out on the factual evidence, bearing in mind the size of the samples?
A. Yes, there were. I mean in a complex case of this type, you would always expect there to be discussions between the police and the laboratory on the analysis and you would expect it to be an ongoing discussion. That did happen in this case and my advice was for the pathologists and other experts to agree a list of what needed to be analysed and then --
Q. Can I pause you there, because that might be quite important.
A. Yes.
Q. There were a number of discussions, both within your laboratory and multidisciplinary discussions at which

the extent of testing was discussed?
A. Yes.
Q. As a result of those discussions, the experts amongst themselves agreed which substances should be tested for?
A. Yes.
Q. It follows from that, doesn't it, given the answer that you have given before, that in practical terms, you were ruling out as a likelihood, so on the balance of probabilities, you were saying, "These are so unlikely that we will not test for them. These are the more likely and therefore we will test for those on the sample that we have".
Is that the thought process?
A. It is more a step wise analysis, so what you don't want to do is submit it for all tests and find out that you have not done the ones that you would have liked to have done later on but you have used up all the sample and you are not able to do it, so it is a balance between doing the tests that you definitely want done first and then a list of priorities, so that you make sure that you cover the ones that are highest priority first and that can take some time depending on the complexity and it will also depend on what samples you have available.
Q. Of course. It follows from that doesn't it that the ones that you are going to test for first are the ones

that you believe are the most likely to be found?
A. Yes. So drugs of abuse and medications would always need to be ruled out and alcohol in any case, so those were done as routine.
Q. Yes.
A. You then decide which ones are a priority after that.
Q. I just wanted to ask you about the analysis for basic drugs. What we are talking about here was a comprehensive analysis not for basic drugs in the terms of aspirin and paracetamol but drugs with what you were looking for was the chemical makeup of known drugs, wasn't it?
A. Yes, so it's chemically basic drugs as opposed to chemically acidic drugs, which includes paracetamol and aspirin, so paracetamol and aspirin are chemically acidic drugs and there is a range of chemically basic drugs.
It is a phrase that we use to encompass a whole group of substances, so that we know which tests we are doing.
Q. There is a huge database of chemically basic drugs?
A. It is fairly -- it is fairly large, yes and again it does have the ability to pick up some unknowns as well, but only chemically basic drugs so there is a limitation to it.

Q. Yes.
The upshot of all the tests that you did at your laboratory -- I am going to confine it to your particular expertise -- was that you could find no evidence of any toxin?
A. No.
MS BARTON: Thank you very much.
THE CORONER: Thank you very much indeed.
Thank you.
A. Thank you.
May I be released?
THE CORONER: Yes, you can. Thank you.
A. Thank you.
MR WASTELL: Sir, now we shall have Dr Branch.
THE CORONER: Thank you.
DR NICHOLAS BRANCH (sworn)
Questions from MR WASTELL
MR WASTELL: Can you state your name for the court, please.
A. Dr Nicholas Philip Branch.
Q. Can you remember when giving your answers to keep your voice up, it is a large court.
A. Right.
Q. Before I come to your report and your involvement in this case, can I just deal with your qualifications with you. You have I think 30 years of experience in the

field of paleoecology?
A. Correct.
Q. I think you are going to need to help the court with what that is?
A. Okay, it is the study of fossilised plant and animal remains. We use those fossilised remains to reconstruct past environments and also past diet.
Q. You are head of archaeology, geography and environmental science at the University of Reading?
A. That's correct.
Q. A post you have been in since 2015?
A. That's correct, I started at Reading in 2008 but I took over the headship in 2015.
Q. From 2008 you were associate professor in paleoecology?
A. Correct.
Q. Prior to that you have been an lecturer and then a senior lecturer in geography and environment since 1999?
A. That's correct.
Q. Also at Reading?
A. No that was at Royal Holloway.
Q. Your degrees, you have a bachelors of science in archaeology science from UCL?
A. Correct.
Q. An MSc in bioarchaeology?

A. Correct.
Q. Again, can you help us with what that is?
A. In that particular year that I took it, I specialised in botany. The masters degree alternated between botany and zoology and of course my specialist area has always been in botany. That year we focused purely on looking at botanical remains, not only from what might be regarded as traditional archaeological contexts, so again looking at fossilised remains in archaeological contexts, but also what I refer to as geological archives, such as lakes and peat bogs, again to reconstruct climate and environmental change as well as diet.
Q. Just to complete your qualifications, you then obtained a PhD in geography?
A. Correct.
Q. Your research focused on palynology and sedimentology. Palynology is the study of pollen grains and other spores, is that right?
A. Correct.
Q. Again found in archaeological and geological deposits?
A. Correct.
Q. All of that sounds like you are looking at ancient remains?
A. Correct.

Q. What qualifies you, as you did in this case, to look at less old or quite recent plant material?
A. My subject area requires a knowledge of modern day plant ecology, so I have a good sound knowledge of plant habitats and plant communities but also through the study of fossilised remains you are often looking at fragmentary evidence, so for instance pollen grains or seeds that are partially decomposed. I have been used on a relatively small number but a range of forensic science cases, because I am often looking at quite fragmentary deposits. In many respects looking at fossilised remains actually puts you in a very strong position to looking at situations where preservation can be an issue.
Q. Have you had involvement in looking at the contents of the human stomach before?
A. Yes, stomach and intestine.
Q. In what forum, is that in a criminal context or a business context?
A. Criminal, and also in an experimental context, where I have done some modern experimental work of looking at pollen and other plant remains within fecal material to basically provide an experimental base to my interpretation of plant remains in a forensic context.
Q. In how many criminal investigations have you been

involved?
A. Oh, it is a good --
Q. Approximately?
A. Approximately half a dozen.
Q. It is not your bread and butter, as it were?
A. No.
Q. Occasionally these cases come along --
A. Yes.
Q. -- where you bring to bear your expertise in identifying decomposed or very old plant material. Is that a fair summary?
A. That's correct.
Q. In this case, you were asked I think, correct me if I am wrong, to retain plant material found in samples from the stomach, duodenum, jejunum and ileum to extract and retain them for the purposes of future identification by others?
A. No, initially for the purposes of my identification.
Q. If possible, I think.
A. If possible.
Q. We can take you to the document in a moment as to what you were asked, but you have a go first but if you cannot, extract and retain for others. Is that fair?
A. Absolutely correct.
Q. There was another string to your role in this case

though, wasn't there, in that you were asked to help the police identify certain potential plant poisons?
A. Correct.
Q. That role though was ultimately taken over by Kew Gardens?
A. Correct.
Q. We will go on to identify the material that you produce, but it is fair to say that originally it was produced for -- well for a criminal investigation and then subsequently you have answered questions in the context of the coronial proceedings?
A. Correct.
Q. Okay. Your material, I think almost more than others, is spread over a number of bundles.
A. Right.
Q. I want you to have in front of you four bundles. The usher will help you here.
A. Okay.
Q. There should be three core expert bundles and a correspondence bundle.
A. Right.
Q. I think which we might be calling the Branch bundle. No offence?
A. Oh really, okay.
It has my name on the front.

Q. If we start with four, I hope we can narrow this to down to two to make it a little bit more manageable for you.
A. Okay.
Q. Starting with bundle 1, behind tab 37, there is pages at the top right-hand corner, it should be page 183.
A. Correct.
Q. That is a case work examinations report produced by you, correct?
A. Correct.
Q. Turning over the page, we see 185, a description of exhibits, examination and nature of examination.
A. Correct.
Q. 186, results and interpretation.
A. Correct.
Q. 187, your conclusions, three broad conclusions which I will come back to later.
A. Right.
Q. If you look at the front of that document. That is not your final report, is it?
A. No, it isn't.
Q. Because there is no qualifications there?
A. Correct.
Q. If we then turn to -- just while we are on that bundle, sorry, flicking over to tab 38, you will see some answers to questions by the coroner dated

15 December 2014. Do you see those? Do you remember answering those questions?
A. Yes.
Q. I think you can safely put away that bundle.
A. Right, okay.
Q. Take up the correspondence bundle, the Branch bundle, and turn to tab 30.
A. 30?
Q. Top right-hand corner, page 174.
A. Yes.
Q. There is an email at the bottom, isn't there, from a Ray Fysh?
A. Yes.
Q. Who is he?
A. Ray Fysh used to work for the Forensic Science Service, I believe as a toxicologist. He has worked very closely with a colleague of mine for a number of years, Dr Stuart Black. Ray has occasionally got me involved in forensic scientist work while I was at Royal Holloway but since I have been at Reading as well. Ray is not a member of staff at the University of Reading, but we use him occasionally also to do some teaching on a forensic science module.
Q. He is a forensic consultant?
A. Yes, that is good way to describe him.

Q. He here, 25 July, is supplying you with a final report?
A. Yes.
Q. Over the page to 176 to 180. I will be corrected if I am wrong but that contains all the same information as the report in the one that we have just seen, but with the addition of your qualifications?
A. Correct.
Q. That is your final report?
A. It is.
Q. Just for confirmation, over the page, tab 31, at the bottom we see an email from you to Mr Fysh referring to by context the report all signed off and with Stuart, is that Dr Black?
A. That's correct.
Q. You had produced a signed version of this that went to Dr Black?
A. Correct.
Q. Then again uncontroversially we don't have a copy of that signed version in the bundles but you are satisfied that that is the final report?
A. Indeed.
Q. Thank you.
That will be one of the main bundles we will look at, so if you keep that to hand. Turning now to file 2, tab 66, top of the page, 548, the page number 548, do

you have that?
A. I do.
Q. There are answers you provided in June 2006 for the purposes of the coronial proceedings, correct?
A. Correct.
Q. Two pages over, page 550, do you see the same questions and answers dated 15 December we saw in the first bundle?
A. Correct.
Q. Then over the page, 552 and 553, just identify for the coroner what that document is?
A. Sorry, what was the question?
Q. Just identify for the coroner what that document is, at 552 and 553?
A. 552 was a draft report that I produced, as you can see it is not in a final format so it is purely in a draft format, essentially a series of my findings that I was recording as I was doing the analysis and recording them directly on to my computer.
That is covered in 552 and 553, so it is essentially like an interim report.
Q. You have told us in answers to questions put to you that that was produced on 19 July, I think?
A. Right.
Q. We can take you to the covering emails later.

A. Okay.
Q. Is that when the contents was created or just when the final version of the draft, if I can put it that way, was forwarded on to others?
A. No, it would have been when the content was created as well, broadly speaking.
Often when I am dealing with very, very small amounts of sample material I am actually typing up my notes on my report directly on to my computer, so this would have been something that I would have been generating over a period of time during the analysis.
Q. I just need to be clear about this, it is a document you are saying you create as you are doing your analysis, not on 19 July? It is a working, living document?
A. It is indeed. That is what I would describe it as.
Q. There are no other notes, any handwritten notes that form the basis of your analysis?
A. No.
Q. That is the notes of your analysis?
A. Correct.
Q. Just going through the rest of the material you provided, just turn over to tab 67, ignore the email at 554 and 555 but turn to page 556. We see an undated report compiled by you there?
A. Yes.

Q. It provides a list of selected poisonous plants found naturally and/or planted in gardens in the UK.
A. Yes.
Q. It has been compiled following consultation of various standard floras and various resources, so the RHS website for example, the Royal Horticultural Society?
A. Yes.
Q. It lists those poisonous plants that have been linked with heart problems if eaten and may lead to death?
A. Yes.
Q. This is something you put together --
A. Correct.
Q. -- but you don't suggest that it is comprehensive?
A. Correct.
Q. You don't have any particular expertise in poisonous plants, do you?
A. That is true, I don't.
Q. If I look over the page at what you have produced, for example, there is no mention of a plant that has been lurking in this case called gelsemium?
A. There isn't, no.
Q. This was produced by you in order to assist the police with identifying potential poisons; is that right?
A. That's correct.
Q. Do you know when it was produced?

A. It was following one of the project meetings organised by Nicholas Craggs, and as an outcome from that meeting I said I would produce this list. The intention at the time was perhaps to use this as a basis for further investigation.
Q. Okay, and going back to -- we will come back to the chronology to try and assist you with when these documents were created later on.
A. Okay.
Q. Just looking at the documents we have, behind 564 and onwards we have an MG21 that we have heard about already today. Do you see that?
A. Yes.
Q. Provided by you?
A. Correct.
Q. If we turn to page 569, do you see there the three exhibits?
A. Correct.
Q. The date at the bottom is 10 January 2013?
A. Yes.
Q. You were provided I think uncontroversially with the duodenal, the jejunal contents on that date by the police?
A. Yes.
Q. And a jar of Wabenb ST/04?

A. Correct.
Q. Which we know from other contexts is thought to be a similar jar or containing a substance similar to that used in the soup of Mr Perepilichnyy. That is what you understood as well, is it?
A. Correct.
Q. Just turning back to the request made of you by the police on 10 January, page 565, do you see there at the top:
"Can you search the submitted samples for any plant material, retaining any that are found along with any other material that can be identified from the digestive system for future examination."
It is that retention for future examination point I drew your attention to, yes?
A. Indeed.
Q. Then:
"Where possible, can you identify it"?
A. Yes.
Q. Then, thirdly, item 3, the jar, as we have seen?
A. Correct.
Q. The last document behind that tab at page 572, are they your notes?
A. They are.
Q. We see at the top, "Monday, December 2012", can you help

us with what they are notes of?
A. It was a meeting conducted at the University of Reading that was chaired by Nicholas Craggs, and there was a team of people involved in the meeting, including Ray Fysh, Stuart Black and myself.
Q. We will come and look at that meeting in a moment.
A. Okay.
Q. Over the page now, sorry, to tab 70, you did in the course of your examination of the plant material use something called SEM?
A. Yes.
Q. Can you explain to the coroner what that is?
A. Scanning electron microscopy. We have a scanning electron microscopy facility at the University of Reading and it is quite normal whereby you have small fragments of plant material to use this high precision microscope which can collect images at very high magnification and we can that as an aid to help identification.
Where things are not possible to identify under a standard light microscope, you might use something that would magnify to a higher degree.
Q. You start with a standard microscope, see if you can identify it by comparison presumably extracts of the material you are trying to identify whether it is that?

A. Yes.
Q. If that doesn't work, you will move on to SEM to take a closer look?
A. Yes.
Q. Are you a specialist in identifying plants from SEM?
A. No.
Q. The email covering it identifies by file which exhibit it relates to.
A. Yes.
Q. I don't think it is necessary for me to take you through which they are --
A. No.
Q. -- but I think it is uncontroversial, isn't it, that these are SEM photographs of specimens taken from the exhibits in which you found plant material?
A. Correct.
Q. Which was everything except the stomach contents?
A. Correct.
Q. We are nearly at the end of our tour of these documents, but if we turn to tab 71, when you went about trying to identify the plant material, extract it from the exhibits and identify it, you took sub samples?
A. Yes.
Q. Do you know approximately the volume of sub samples you took?

A. Yes, it is really just approximate because they were just wet weights which I estimated, so it was probably approximately 3 mils of material, something like that.
Q. What proportion of the original exhibit would that be, roughly?
A. Maybe something like 10 per cent, maybe a bit more, something like that.
Q. These photographs behind tab 71, just explain to the coroner what they are.
A. Sorry, can you repeat that, sorry?
Q. The photographs behind tab 71, they start at page 615.
A. Sorry, yes.
Q. They have been supplied by you, I think?
A. Yes, they have.
Q. Can you just help the coroner with what they are?
A. Yes, of course, so these are my sub samples that were retained at the University of Reading. When the exhibits were returned to the police, these were retained at the University of Reading in a refrigerator, so these are my sub sample that is are in these different labels containers.
The first photograph is -- you can see the plastic container there that they were stored in and the various different plastic and glass containers and inside some of those are glass vials.

Q. I don't think we need to go through every photograph, but in broad terms they are the sub samples?
A. Sorry -- they are.
Q. They were retained at Reading between 2013 and May 2017?
A. Correct.
Q. It is right, isn't it, that you were not aware they were still there?
A. No, I was aware they were still there.
Q. You were?
A. Well, in the sense that I was -- well I was only aware recently that they were still there, because we thought all the samples had been returned to the police, had been collected by the police.
Q. When in fact they were still in your fridge?
A. Yes. I can explain that further if you would like.
Q. I think we will come back to that in a moment.
A. Okay.
Q. Finally in this bundle, behind tab 73, some questions and answers. Tab 73, page 628. Some questions and answers posed and answered in May 2017.
A. Yes.
Q. Finally, in bundle 3, tab 95, page 824 --
A. Yes.
Q. -- a joint statement with Dr Kite and Professor Simmonds in which you participated --

A. Correct.
Q. -- in May 2017.
Is it stapled?
A. It is.
Q. If you pull that out, then you can get rid of bundle 3.
The opinions in that joint statement, you give opinions in questions 2 to 17 but no further?
A. Correct.
Q. Does that remain your professional opinion?
A. Yes.
Q. Thank you.
Looking back to your involvement in this case, you mentioned a meeting at Reading. If you now go back to file 2, tab 50, page 370.
A. Yes.
Q. You were, it tells us here, present at a meeting of various experts, including Mr Fysh and Nick Craggs, he was the crime scene coordinator for the police?
A. Correct.
Q. 17 December. Do you think that is the meeting we have your notes for?
A. It should be, sorry, I have forgotten the date on my notes.
Q. It simply said "Monday, December 2012", take it from me 17 December was Monday.

A. Indeed.
Q. Is that your first involvement in the case?
A. I presume it must have been, yes, because I only have one set of notes from a meeting.
Q. We see from the document you were given a briefing by DCI Pollard, is that right?
A. Yes.
Q. About the background to the case. At 916 you were told some information about the soup that he was reported to have had for lunch?
A. Yes.
Q. At 917, you see at the bottom there the discussion about a spreadsheet of poisons.
A. Hmm.
Q. You were asked, I think it is right, to help produce a list of poisonous plants to forward to Mr Craggs, correct?
A. Correct.
Q. Do you think that is the report that we have seen with the colour photographs?
A. It was subsequent to this meeting, yes.
Q. That is the result of the meeting, you were given an action point?
A. Correct.
Q. "Try and help us"?

A. Correct, yes.
Q. Did you make clear the limits of your expertise in plant poisons, as it were?
A. Oh very much so. Very much so.
Q. Were you emailed a spreadsheet and asked to help populate it; do you recall that?
A. Yes, I was actually, yes, sorry, I had forgotten but you are absolutely right, I was. I think everybody was circulated that spreadsheet.
Q. We don't see any correspondence about that in the bundle.
A. No.
Q. You no longer have that correspondence or?
A. No, I don't think I responded to it because I didn't feel qualified to comment on that particular spreadsheet. I simply generated the document that you have referred to.
Q. We also see that you were asked at that meeting to help identify samples submitted to you?
A. Correct.
Q. The samples that arrived on 10 January we have already seen. You were later sent some further samples in March, weren't you, 8 March?
A. Yes, I was.
Q. That was the stomach contents?

A. Yes.
Q. And the ileal contents?
A. Correct.
Q. Let's go to your report in the correspondence bundle to see the results of your examination.
A. Okay.
Q. Back to the Branch bundle, the correspondence bundle, tab 30, page 176. Page 178, you see possession of exhibits there?
A. Yes.
Q. That is wrong, isn't it, we have just seen that? Those dates are wrong, "Between 8 January and 19 February the following exhibits were delivered"?
A. Yes. Yes, I remember some email correspondence taking place about this. There was some confusion over the chronology.
Q. Remember to keep your voice up.
A. Sorry, there was some confusion over the chronology. I remember there being some email discussion about the chronology and it was subsequently confirmed that these dates were incorrect, you are right.
Q. You were delivered exhibits in two bunches, 10 January and then 8 March?
A. Yes.
Q. The nature of your examination, dealt with at the bottom

of the page but over, you explained that you created sub samples. Then just tell us what did you do with the sub samples in order to try and identify the material?
A. Okay, so when the sub samples are taken from the main exhibits, they are simply fragmented -- sorry, dispersed in distilled water. Then I put them under a standard light microscope and then I attempted to pick out plant fragments, being careful again not to remove necessarily all the plant fragments but things I thought were potentially identifiable.
Q. Your voice dropped there, you didn't pick out every bit of plant material?
A. No, not every bit of plant material because at that stage I felt as I have done on previous occasions on forensic cases that the samples could be used for a whole range of other analyses. I picked out things that are fragments of plant material that I thought could be potentially identifiable.
Q. Is that what I might think of as macroscopic pieces?
A. That's correct.
Q. Visible to the eye?
A. Visible to the naked eye, but actually require a microscope for identification.
Q. You distill them I think in water?
A. Correct.

Q. Take the fragments with forceps?
A. Yes.
Q. Then do you preserve them in any way?
A. No, they are often -- for long term they are often stored in alcohol, but on this occasion they were just kept in distilled water because I wasn't sure what might happen to the samples next.
Q. Sorry?
A. I didn't want to store them in ethanol, which is what I would normally do.
Q. Those are the sub samples we have seen in photographs?
A. Correct.
Q. Looking at your findings, "Results and interpretation", the stomach content you found no plant material?
A. Correct.
Q. The jejunum and the duodenum, so the first two exhibits that you were provided with in January --
A. Yes.
Q. -- you did find small fragments of plant material?
A. Correct.
Q. The sizes you give are between 300 micrometers and 600 micrometers. Just for the coroner's benefit, is that a thousandth of a millimetre?
A. It is, a micron is a thousandth of a millimetre.
Q. We are getting up to 0.3 to 0.6 of a millimetre?

A. Mm.
Q. What did you do to try and identify those fragments?
A. Initially I looked at them under a standard light microscope, realised clearly they were very small fragments and I certainly was not qualified to identify them. That is when I went ahead and took some SEM images, because I felt that a plant anatomist may have a better chance of identifying them with a series of good quality photographs.
Q. You do reach a conclusion in your report that they were likely to be sorrel?
A. Yes.
Q. If you are not qualified to look at them under the ordinary microscope and you are not qualified to look at them under the SEM, how do you reach that conclusion?
A. I reach that conclusion on the basis of probably sort of two factors, (1) the information I was given about the last meal.
MR MOXON BROWNE: By what?
A. The information I was given about the last meal and it containing sorrel and because it was yes, it is very very fine plant material and the jar of Wabanb I was given, which is the jar of sorrel, I noticed that it breaks down into very sort of fine slimy plant material and I concluded that it might be probably sorrel,

therefore that I had actually found in the intestinal contents, but probably sorrel.
MR WASTELL: Let me deal with the second of those.
A. Yes.
Q. What is it, using your experience, that you are looking at to compare the two, the jar of sorrel provided to you and the material extracted from the duodenum and the jejunum?
A. Yes, it is the surface characteristics, I might look at, I might look at just general quite superficial similarities between the two, but they are only superficial similarities, hence I have always emphasised that I believe it probably is sorrel but I can't be certain.
Q. What sort of surface characteristics?
A. For instance whether there is any evidence of things like surface ornamentation.
Q. Surface?
A. Ornamentation, so for instance if it has any sculpturing on the surface, any grooves on the surface, or any bumps or lumps, surface characteristics that we might use.
Q. Did you find that in this case?
A. No.
Q. Surface ornamentation?
A. No, what I found was a surface that was actually just

a sort of mildly coarse surface to the plant material, which would be consistent with for instance perhaps a small fragment of leaf material, something like that.
Q. If you can't use the ornamentation, what else are you using to get a probable correlation between the two?
A. Yes, it is really based on the information that I was given about the last meal.
Q. That is circular, isn't it?
A. It is.
Q. If you are told here is something, we understand he has eaten sorrel, can you identify it? And you use the very bit of information you are given, it is just going to take it in a circle?
A. It is, it might be deemed to be quite unscientific but ultimately this plant material remains unidentifiable but there is plant material there. Based on the information I have been given, it is likely to be sorrel but I can't be certain of that. What I wanted to do was to give a pointer to the analyst that might then look at the plant material in greater detail and hopefully to carry out some chemistry, because at that stage there was no immediate plan to carry out any detailed analysis of these intestinal contents such as the work that has been subsequently done by Kew but to give a point to them because what I wanted to effectively do is to

eliminate the presence of -- sorry, to either confirm or eliminate the presence of sorrel.
Q. If you are simply taking as your primary mode of identification --
A. Yes.
Q. -- the information that he is believed to have eaten sorrel for his last meal --
A. Correct.
Q. -- it is entirely unreliable in coming to the conclusion that it is probably sorrel, simply by finding plant material?
A. Okay, yes.
Q. You accept that?
A. I do.
Q. You must have relied on, if this conclusion is to stand up, on features of the extracts in the intestines as compared to features of the jar of sorrel?
A. Well, only a broad similarity.
Q. What were those broad similarities?
A. The broad similarity is to say there is no major surface ornamentation, so there was nothing that immediately distinguished sorrel in the reference material if you like, the jar of material that I was given, from the material that I recovered from the stomach contents. Superficially they looked very similar in that the

surface, there was a lack of surface ornamentation, there was a lack of sort of grooves in the surface, anything that could positively distinguish between them. They looked broadly similar.
Q. In your experience, is the lack of ornamentation an identifying feature?
A. Correct.
Q. Is that right?
A. Yes.
Q. So both specific ornamentation and the lack of ornamentation?
A. Yes.
Q. How many plant species have no ornamentation?
A. You are correct.
Q. How many?
A. Well there is a large number of plants that would not have any specific ornamentation.
Q. The fact that it doesn't have ornamentation is not a particularly good identifying feature?
A. No.
Q. Was there anything else?
A. No.
Q. Lack of grooves, you mentioned?
A. No, there wouldn't be anything that could positively -- you are right, it could be a number of different plant

species, that's correct.
Q. All you can say, really, there is plant material, it has no particular identifying features?
A. No.
Q. Neither does the jar of sorrel?
A. Correct.
Q. If he has in fact eaten sorrel, it could be sorrel?
A. Indeed.
Q. You cannot really get to the point of saying it probably is sorrel without relying on the very bit of information you are asked to test?
A. Yes.
Q. You accept that?
A. I do, I accept that.
Q. What needed to be done with the material you have retained from the duodenum and the jejunum was to send it to specialists to get them to identify it?
A. That was the outcome from the work, correct.
Q. That was one of the purposes of extracting and retaining the material?
A. Correct.
Q. You are aware I think are you that Kew are now doing DNA testing on that material that you have extracted?
A. Indeed.
Q. In terms of the ileal contents, AWF35, just for those of

us who not particularly familiar, that is further away from the stomach than the duodenum and the jejunum. Is that right?
A. Yes.
Q. Next to the large colon?
A. Indeed.
Q. In that case you had more basis to reach a conclusion as to what you found in there?
A. Indeed.
Q. Just help the coroner with that.
A. In this case I found a seed, and that seed could be positively identified using herbarium material, so reference herbarium material, because it is not just a fragment of plant material, it is the whole seed that has been preserved. Again it has features of surface ornamentation, its shape, its colour, so I immediately identified it as belonging to a particular family, the ABAC family and then subsequently was referenced to herbarium material, positively identified it as caraway.
Q. In that conclusion you have said you are satisfied beyond reasonable doubt?
A. Correct.
Q. You have no doubt?
A. No doubts.
Q. Turning over the page to 180, you then reach three

conclusions.
The first I think we have dealt with at length, the probable sorrel identification, which now I think you accept you cannot really stand by?
A. Correct.
Q. The beyond reasonable doubt identification, although you don't use it in those terms in the report but the identification of caraway further up the gut?
A. Correct.
Q. Then a third conclusion:
"The tests showed that Alexander Perepilichnyy had recently consumed the plant material sorrel and caraway, but had not ingested any toxic plant material."
That conclusion doesn't stand up either, does it? Because firstly you cannot say that he had recently consumed sorrel.
A. Correct.
Q. You can only say to whatever standard you have reached in the fairly basic identification tests you have gone through?
A. Hmm.
Q. Correct?
A. Correct.
Q. You certainly can't say, on the basis of your testing, I appreciate you sent -- well the material has now gone

to others for testing, that he had not ingested any toxic plant material?
A. Based on my analyses, where I concluded at the time that it was probably sorrel and caraway was present, so based on those results they are not indicative of plant material.
Q. If it is sorrel, that is not toxic?
A. Correct.
Q. But that is as far as you can go?
A. Correct.
Q. Because you don't see for example the plant material you didn't extract?
A. Correct.
Q. That might be below the size that you are interested in --
A. Correct.
Q. -- correct?
A. Correct.
Q. You don't see for example material that may not be in fragmentary form?
A. Correct.
Q. It may be completely -- I am not sure what the phrase is but mixed in with the stomach or duodenum content?
A. Finally disseminated material that is identifiable, probably.

Q. The best you can say realistically is, "I found plant material, macroscopic plant material ..."
A. Correct.
Q. "... which looks like sorrel ..."
A. Correct.
Q. "... using the comparison."
A. Yes.
Q. "I found caraway further up the gut ..."
A. Yes.
Q. "... which I am pretty sure about."
A. Yes.
Q. And make no further other comment?
A. That is true.
Q. Just over the page, page 181, that appendix C, that is not part of your report, is it?
A. No, I am not sure why that is there.
Q. No, that is part of Dr Black's report?
A. It is, indeed.
Q. I think, given the answers you have given me, I don't need to take you through the chronology of how your opinions evolve. Because actually it is right, isn't it, that all the way along you were saying there is an unidentified substance in the jejunum and duodenum --
A. Correct.
Q. -- it needs to go elsewhere to be tested?

A. Correct.
Q. I think there is -- cumin is mentioned in the 20 March meeting with the police --
A. It was.
Q. -- but actually you suggest that is just an exemplar at that stage?
A. It was, I mentioned a number of plants actually but that was the only one that was recorded. These were just ones I sort of said, "It could be this, it could be that", I happened to mention cumin, but I think I probably mentioned caraway as well, but that is the one that went into the minutes.
Q. As of 20 March you had not concluded your investigations?
A. No, no. No.
Q. The one point I think I really do need to get you to address is where this conclusion 3 came from.
A. Right.
Q. Because if we look at the evolution of your report, going to these Branch bundle --
THE CORONER: Mr Wastell, will this take more than about five minutes?
MR WASTELL: About five minutes, and this should be pretty much the end.
THE CORONER: That is fine.

If it is five minutes we will do it now, otherwise we would do it at 2.05. We will do it now.
MR WASTELL: If you turn to tab 26 of the correspondence bundle.
A. Yes.
Q. Sorry, that is a false reference, if you turn to page 63, which is tab 18.
A. Tab 18? Yes.
Q. June 2013, Mr Fysh is writing there:
"Going to have to push you for a short report."
Do you see that?
A. Indeed.
Q. Had you communicated with him the results of your analysis at that stage?
A. I would have thought so. I can't recollect in detail but I would have thought so because we were in quite regular communication about the case.
Q. Would that have been in person, by phone or email?
A. It would have been -- it could have been either actually to be honest because Ray Fysh visits the University of Reading on a frequent basis.
Q. All right. If we go to tab 20, 15 July, again, chasing you, but he is saying here, see at the bottom:
"I will draft short reports for both of you this week, minus the results and comments."

Did you understand that he was going to draft the report and you would just simply fit in your results and opinion?
A. Indeed, so what he was doing is putting the structure together for the reports so they were consistent in terms of the main headings. Then I was writing my report with the detail, providing the detail, yes.
Q. Tab 22, 18 July, at the bottom there, you are sent through a report to check for accuracy and then add in any gaps marked red, yes?
A. Indeed.
Q. Turning over to 129, so we see red "qualifications"?
A. Indeed.
Q. Red what you are a senior lecturer in, yes?
A. Agreed.
Q. Turning over the page, he has given you the structure of what background information there is, correct?
A. Yes.
Q. Turning over to 131, or 130, he has given you the incorrect information about when the exhibits were provided?
A. Yes. Yes, yes.
Q. Purpose of examination, "Nature of examination", in red to fill in?
A. Hmm.

Q. Results and interpretation. Yes?
A. Yes.
Q. Then this in conclusion:
"The tests show that Alexander Perepilichnyy had recently consumed [blank] but had not ingested any toxic plant material."
Yes?
A. Correct.
Q. Can you say now where that opinion came from?
A. It certainly came from discussions between us.
Q. Right.
A. There is no doubt about that because what Ray and I were discussing with Stuart Black is did I have any evidence for the presence of toxic plant material, and the conclusion I came to was that I didn't.
Q. Yes. Which is different I think to the conclusion that is recorded there:
"He had not ingested any toxic material."
Is different to:
"I had not found any evidence that he ingested any toxic material."
A. Correct, I had not found any evidence, yes.
Q. We then see the draft report coming in from you which crosses with that, don't we, on 19 July?
A. Indeed we do.

Q. You have ignored what he sent to you, sent the draft?
A. Indeed.
Q. Then I think he sends it back to you on 24 July, but let's just look at the draft again.
A. Can you remind me where the draft is, sorry?
Q. Tab 23, 143, you are sending an email to Ray Fysh saying, "Will this suffice?"
A. Yes.
Q. He says:
"Sorry, please ignore last email."
Turning over the page, there is your draft report, yes?
A. Indeed.
Q. The conclusions of which, on page 145, don't include that third opinion?
A. That's correct.
Q. So typing your analysis as you went along, you hadn't reached that opinion?
A. No.
Q. I think the emails will then show he sent you back his structure, your content, but added back in the third opinion?
A. Well, I added back in the third opinion.
Q. He did.
A. Well, sorry, in what he sent back, you are right.

Q. Yes.
A. In terms of the structure, he put in that opinion.
Q. If we look at 146, which is behind tab 24, by 22 July --
A. Yes.
Q. Sorry, it is a false reference again. If you turn to tab 30, as we have seen --
A. Could you say that again?
Q. Tab 30.
A. Tab 30.
Q. 25 July from Ray Fysh to you:
"Please see final report, if happy can you sign it."
It is the report we have been looking at, which has become your final report. Same structure that Mr Fysh had suggested to you, same content that you provided him back in the draft report but with the addition at page 180 of this third conclusion.
A. Correct.
Q. I have to ask you, all along was it not Mr Fysh that had given you this conclusion, not you?
A. No, it is not. I can -- it is my conclusion because it is in my report. But I do accept that it has come out of discussion with Ray Fysh, without a shadow of a doubt. In terms of we discussed the results that I had produced from this piece of work, but ultimately it is my responsibility because it is my name on the

report. So it is my conclusion.
MR WASTELL: Yes.
Sir, that may be a convenient moment.
MR MOXON BROWNE: Sir, if it assists I can say that I shall be very brief with this witness and -- speaking for myself -- I am confident that Dr Kite will be comfortably dealt with today.
THE CORONER: Good. All right, thank you very much.
Thank you, I will say 2.10.
(1.07 pm)
(The Luncheon Adjournment)
(2.20 pm)
THE CORONER: Good afternoon.
MR MOXON BROWNE: May it please you, sir.
Questions from MR MOXON BROWNE
MR MOXON BROWNE: Dr Branch, just a few questions for you. I would like to look first of all, if I may, at the handwritten note of your first briefing meeting, which I have at page 572 of a bundle I am told I should call "Core experts bundle 2".
Do you have that?
Your writing, if I may say, so is not always that easy to read but can I just read from the top:
"Operation Daphne, Monday, December 2012, University of Reading, death of AP, Weybridge, Surrey. 14 November

..."
What "of death"? Do you see that, 14 November, "date of death" is that?
A. It says "date of death", yes.
Q. I'm sorry?
A. "Date of death".
Q. I think the date of death was actually 10 November:
"What were his movements prior to death? Abroad, UK ...
Poisons?
A. "Poisons" I think that says, yes.
Q. "Very vague, vague assumptions, probably unfounded."
Who was telling you that the allegations about poison were probably unfounded at that meeting?
A. It was a general discussion that was taking place involving a team of specialists, and the coroner was there.
Q. Who was there, the coroner?
A. I believe it was the coroner, yes -- sorry, the pathologist not the coroner. The pathologist, sorry.
The pathologist was referring to -- basically questions were being put to the pathologist about the possible cause of death and whether there was particular evidence for certain things. I think the pathologist's response was very much that there was no direct evidence

to suggest that there was evidence for poisoning.
Q. Yes.
Can you read the next two lines, because I find them difficult?
A. Hmm, yes:
"Detailed post mortem on 30 November. No signs of third party ..."
I think it says, "... unusual distribution of coronary arteries, due to exercising".
Q. Yes. Was someone telling you that there was an abnormal distribution of the coronary arteries as a result of exercise or --
A. That is what it implies.
Q. Very well.
Can I just fasten on the dates of what you did in January through to April 2013, I am not going to take you to the documents but if you want to interrupt me and say, "Can I see the document?" Please do.
I suggest the evidence shows that you received the two samples from the upper part of the digestive tract on 10 January, together with a tub of the sorrel as the sample. You then waited I think and did nothing until 30 or maybe 31 January, when you fished out some solid vegetable material from those samples?
A. Correct.

Q. Why did wait in this case between the 10th and the 30th or 31st before doing anything?
A. Probably other commitments at work.
Q. You had other commitments, yes.
I think it is right that you understood as a result of the meeting you had been to that it was essentially your job to try to find out what Mr Perepilichnyy had been eating?
A. Correct.
Q. To put it rather bluntly and oversimplified, what he had had for lunch?
A. Yes.
Q. That was down to you.
You waited about three weeks and then you finished out the relevant bits. I think you then did nothing at all all through February, February went by, until about mid-March. Is that right?
A. I think that would be correct. I can't remember the specifics.
Q. Having finished out the relevant bits, why did you then wait for six weeks before doing anything more?
A. I actually have no recollection of why.
Q. Of why that was?
A. All I can say is it is spring term, heavy teaching load. I can't think of any particular reason why I didn't do

the work.
Q. Can I suggest a reason that may jog your memory or if I am wrong you can tell me, that on 31st, you had an email exchange with Mr Fysh in which you told him that the bits were too small to identify but you thought SEM might do the trick, scanning electron microscope?
A. Yes.
Q. You said that your university had the capacity to do it but it could also be done by Kew.
A. Correct.
Q. Essentially what you were doing thereafter with your busy workload was waiting to be told what to do?
A. Yes, I think is that is probably quite reasonable.
Q. No one did tell you what to do until mid-March, when I think you received an email alerting you to the fact there was going to be a meeting on 20 March at Reading at which various people were going to report on what they had found and you of course at that stage hadn't found anything, what you had done was to fish out some bits of vegetable material.
You thought, I suggest, that you ought to do something in preparation for that meeting so you have given us a date and it comes from you, I can't find a document that supports it but you say that on 16 March, that is just after receiving the email and

three or four days before the projected meeting, you carried out scanning electron microscopic examination that you have told us about. By this time your two upper intestinal tract samples had been joined by the ileum, the third section. I think it is a bit of information that comes from you and from nowhere else, it is recorded in your report that the section of the ileum that you had was actually from the last section?
A. I don't think it is recorded -- I don't think I had the specifics on where in the ileum it was recorded.
Q. I think in fact you did but I don't think it is necessary to take you to that but the organ is some 11 metres long, so whereabouts in the ileum it comes from could be of some importance, do you agree?
A. I agree.
Q. Yes.
At that point you did the scanning electron work and you produced those extraordinarily clear and high magnification images that you have shown us?
A. Indeed.
Q. But I think they didn't help you to identify what the material was?
A. Correct.
Q. I just want to take you to one document -- I said I wouldn't but I am going to take you to one document

that I think just encapsulates where you were at at that point. It is in the core bundle number 2 at 596, I think that is the same bundle that you were looking in a moment ago. This is in answer to some questions that Mr Suter the solicitor to this Inquest was asking you in May, quite recently, do you remember that?
A. I do.
Q. Do you have the page?
A. I have indeed.
Q. If we can go down to the bottom, it is the penultimate bullet point:
"Whether you were able to ascertain from each image what the material was, was likely to be?"
You gave the answer, so there we have it in a nutshell, only that it was plant material?
A. Correct.
Q. To be frank to be it, that was as far as you ever got really?
A. Indeed.
Q. You never did any further work and so that was it really?
A. Indeed.
Q. You went to the meeting, if plant material was mentioned at all and the various minutes record it slightly differently but I think your recollection is if it was

mentioned at all it was simply that you had recovered plant material?
A. Indeed, that's correct.
Q. You did say, I don't know whether it matters very much, you did say at that meeting that the seeds which must have come -- which I think came from the ileum, were, you mentioned cumin, you say that was slightly misrecorded?
A. It was, simply because I hadn't gone to the herbarium at this stage to actually make a positive identification, so that was because the seed is very characteristic of a particular plant family and therefore I was giving examples of plants in that family that have a very distinctive ornamentation and one of those was cumin, just to illustrate the point.
Q. I think you mentioned in your report, and I think it is an everyday experience, that caraway and cumin both have very distinctive smells, you say the crush the seed and there is that smell of aniseed I would suggest, which was very clear to you?
A. Yes.
Q. Oddly you were subsequently asked whether you had done any smelling tests and you said no, but it is recorded in your report you did?
A. I think I misinterpreted the question, because I thought

the question was relating to, if you like, the whole sample rather than the crushing of the seeds because I remember when I opened the original jars of material I didn't detect any smell.

Q. You agree with the general proposition that cumin smells of curry and caraway smells of aniseed?

A. Quite.

Q. That is why you are absolutely certain about that?

A. Yes.

Q. There is at the moment a paucity of evidence about how long material takes to pass through the digestive tract, I want to get as much as I can from where I can. Do you have any views about when someone might have eaten something that was at the bottom end of the ileum?

A. It could take potentially -- I have put in a previous report possibly up to sort of 72 hours, that is what I have read in various sort of articles that I have read on the subject, it could take several days depending on an individual's digestive system.

Q. What I am suggesting is that whether it was cumin or caraway or anything else probably isn't something that the coroner needs to spend much time on, because it was probably something he ate either in the early morning or the previous day.

A. I entirely agree with you.

Q. Thank you, that is very helpful.

THE CORONER: Do you know about that? Is that within your field of expertise.

A. In terms of the length of time it takes to go through --

THE CORONER: Yes.

A. No, what I have done is I have carried out some experimental work which I have referred to earlier where we have carried out two sets of experiments where we have put people on specific diets and then we have tried to track traces through to the stomach and through the intestine. Then we have collected the fecal material and analysed it to get a sense of how long it is taking to go through the digestive tract. That is only with two individuals and I appreciate it varies from individual to individual, that is the sort of average time it might take where we have detected spikes that we have added to samples and how long it has taken to go through. That is specifically with respect to pollen, but it would apply generally to plant material as well.

MR MOXON BROWNE: That may be of assistance, thank you.

We are now at 20 March. I think that some of the samples of the material from which you have worked were picked up and sent to Kew on either 10 or 11 April, that accords with the records and I think with your recollection?

A. Indeed.

Q. Your understanding was that they would be able to do an identification using their plant expertise that, of course, you didn't have?

A. Correct.

Q. In particular you thought that the SEM images might help?

A. Indeed, yes.

Q. However, the jars containing the bits of material that seemed to represent the last meal, in other words what did Alexander have for lunch, didn't actually go to Kew and nor did the images?

A. No, that is true.

Q. I don't know what happened with the images but, as you have told us, the plant material was put in a fridge where it remained until very recently --

A. Correct.

Q. -- for years and years?

Even if someone had told them to do so, Kew did not in fact have the material that might have helped them answer the question that everyone seemed to, at some stage, have some interest in, what did Alexander have for lunch?

A. Indeed. I can provide an explanation of what I think happened.

Q. The coroner may have questions for you or others. I don't, it is something that happened.

A. Okay.

Q. I think you have told us that as of today, that is to say five years after the death, coming up to that, nobody knows -- apart from what Mrs Perepilichnaya has been able to tell us -- what Alexander had for lunch and I think you mentioned that tests are at this moment going on?

A. Correct.

Q. It is in inescapable that the reason for that is that nobody thought to arrange for the transport of the relevant samples as it was intended and indeed the images, from Reading to Kew?

A. That is true, particularly in the case of the images.

Q. Yes.

I think you have agreed that Mr Fysh had a considerable input into your final report -- you said there were discussions and so on?

A. Indeed.

Q. And indeed that he was the author of the conclusion that Mr Perepilichnyy hadn't consumed anything toxic?

A. Well it is noted in that document that you have seen, but the conclusion is mine because my name is on the report.

Q. That I understand and that is perhaps an appropriate attitude to take, but of course you do have a responsibility, which I am sure you recognise, and you realise that conclusion found its way into Dr Fysh's casework examinations report and it became part of the mythology of the case, the legend, that he hadn't consumed any -- you appreciate that?
A. I do.
Q. You understand where it came from?
A. Indeed.
Q. You described, is it Mr Fysh, Dr Fysh, as a consultant. He was obviously in this case, as you can see, working very closely with Surrey Police?
A. Correct.
MR MOXON BROWNE: Yes.
Thank you very much.
Questions from MS HILL
MS HILL: Just a couple of areas if I may, can I ask you to turn up, please, the joint statement which I think is at 826 of the expert bundle.
A. What is the number again, sorry?
Q. 826, that will be in volume 3, is it?
A. Volume 3?
Q. It is behind tab 95 or is it loose there on the table? It is the joint statement.

A. The joint statement, I have that here, sorry.
Q. Can I just ask you to look please at page 826 and the answer to question B7.
A. Yes.
Q. Just make this clear, B7, the question that was asked of you is this:
"Samples AWF 32 to 35 were taken on 30 November, by Dr Fegan-Earl and Dr Ratcliffe had disposed of the stomach contents before those samples were taken. Were you aware of that when preparing your reports? If not, does that impact upon any of the conclusions you reached?"
Is this right, that the answer that was given by all three of you was that:
"We were not aware that the stomach contents had been disposed of when preparing our report."
A. That's correct.
Q. Then I think you added this additional note, is this right:
"This information has serious implications for my study, it may mean that the samples I studied bear no relationship to the last meal or that the samples are not representative of the entire contents of the last meal. It means the results of my study are probably biased and therefore unreliable because of the nature of

the sample."
A. That's correct.
Q. The second area briefly if I may, could you turn up the correspondence bundle, could I ask you to turn up please page 47 in the top right-hand corner.
A. Sorry, is that tab 47?
Q. It is page 47, I think it is behind tab 13 but it is the numbering in the top right-hand corner. Just a couple of questions about dates, please.
A. Okay.
Q. Do you have page 47?
A. I have.
Q. Just to put this in context, page 47 is the email I think sent by Mr Craggs after you had the meeting in March where all of you got together. He says in this email of 23 March:
"Quick update to thank you for your contribution to this case. The meeting on Wednesday proved very productive ..."
Then set in train various work items or tasks if you like after that meeting, is that right?
A. Yes, it is true.
Q. Just going briefly through your correspondence bundle, we can see that that continues throughout March and April a little bit. Turn on would you please to

page 60.
Essentially if I've got this right, what seems to be happening is Mr Fysh communicating various things to you and the other experts, is that right? In a general sense Mr Fysh was passing on emails to you from some of the other experts and things of that nature, that was a role he was performing?
A. He was, very much so.
Q. Do we see at the bottom of page 60 an email from Dr Simmonds to Mr Fysh and others, including Mr Craggs, to say this:
"Dear Ben, in confidence, the analysis of the samples sent to Kew continues and we have not confirmed the presence of any of the usual toxins. However, an analysis of the stomach indicates it might contain gelsemicine, which is a toxic alkaloid found in the rhizomes of an American plant, gelsemium sempervirens. A quick look on the internet and some of the literature indicates death is quick and the minimum lethal dose could be slight. No human data around, but this is the data for male rabbits. We will do some more work as this is a very tentative identification but wanted to share this finding with you."
Do you see that?
A. Yes.

Q. That is on 14 May and it looks does it from following up the page on page 60 that Mr Fysh sends that on to you and said, "How does this fit with your work?"
A. Yes, that's correct.
Q. You were aware, were you, that the Kew experts had found something that they thought might be gelsemium and might be a poison?
A. That's correct.
Q. Is this right, just taking it quite briefly if I may, that discussions continued throughout May and is this the chronology, that on 21 June, if you look please at page 103 --
A. I have it.
Q. -- Mr Craggs on that date appears to email Professor Simmonds -- I think I called her Dr before, it is Professor Simmonds, isn't it? Emailed her and asked for a copy of her report. Do you see that on page 103?
A. I can.
Q. He says "Hi Monique, hope all is okay, I can't recall the position as various experts have now completed all their work ..."
He needed the report from Professor Simmonds. I think what happens as well is similarly if you go back in the bundle, please, to 63, on 26 June, you I think are asked for your report?

A. Yes.
Q. What seems to happen, if you look on page 102, please, I'm sorry to jump around but trying to do it in chronological order. On 102 it is not until 13 July that Professor Simmonds provides her report, even though, if you look over the page at 104, it appears to be dated 13 June, it looks as if it wasn't provided until 13 July.
A. Hmm.
Q. We can see, as counsel for the coroner has taken you through, there were various discussions about the details of the reports but is that a broad summary, that these discussions continued and particular issues were being raised throughout May and into June and July of that year?
A. Indeed.
Q. There was further discussion for example about the role of cardiac glycoside and things of that nature that may have not touched you but was something the other experts were looking at, is that right?
A. That's correct.
Q. Can I ask you, please, well, perhaps just take it from me and for the learned coroner's note, volume 2, page 529 is the statement made by Surrey Police about the death of Mr Perepilichnyy. You don't need to turn

it up but at page 529 of volume 2, the announcement was made by Surrey Police that there was no evidence to suggest that there was any third-party involvement in the death. The date of that we can elicit from volume 1, page 259, was 7 June.
A. Right.
Q. Were you aware of that announcement having been made or not?
A. I have no recollection of it. But I apologise it is some time ago. I can't remember the specifics.
Q. Certainly from the chronology we have just been through, there were still discussions going on about the role of gelsemium at least?
A. Indeed.
Q. Both before and after that date?
A. There was regular correspondence.
Q. But it continued beyond 7 June?
A. Indeed.
MS HILL: Thank you.
THE CORONER: Thank you very much indeed.
Thank you.
A. Am I released?
THE CORONER: Yes.
MR SKELTON: Sir, we will now hear from Dr Kite.

DR GEOFFREY KITE (sworn)
Questions from MR SKELTON
MR SKELTON: Dr Kite, could you say your full name to the court, please.
A. It is Geoffrey Charles Kite.
Q. I can hear from your first words that you are having some difficulty projecting your voice today?
A. I have had this for about two years and I am afraid the doctors cannot find a solution to it, so I will do my best and try and speak loud and slowly.
Q. If you need a break or a glass of water, will you say please, we will probably have a break in about half an hour to 45 minutes.
Thank you.
What is your position at Kew?
A. Currently I am the laboratory manager in charge of various pieces of analytical equipment, that involves their maintenance and I am responsible for operating the piece of equipment that is mainly been used in this Inquiry.
Q. Which is what?
A. It is a liquid chromatograph mass spectrometer.
Q. You may need to speak quite slowly as well as quite loudly, thank you.
Your background is as botanist, is it?

A. Yes, I did a degree in botany and a PhD looking at some fundamental aspects of plant evolution and I joined Kew as a generalist and since joining Kew I funnelled into chemical analysis. I was fortunate at Kew we had one of the first benchtop LCMSs, so I have been analysing these interests right from the early days when they were quite difficult instruments to use. Nowadays it is white box technology.

Q. You are already getting into the names of the instruments and techniques, I am going to take you through the terminology if I may in a moment but first of all can I introduce you or remind you of the evidence that is before the court.

A. Yes.

Q. You are effectively part of Monique Simmonds's, Professor Simmonds's team?

A. Not currently, no, because we had a restructure. So I am not part of her team now.

Q. You were at the time when the original --

A. I was at the time of the first investigation.

Q. Thank you.

You assisted her in producing analysis of Mr Perepilichnyy's stomach contents and blood in May 2013?

A. Yes.

Q. Which we find appended to her statement dated 13 June 2013?

A. Yes.

Q. You assisted with the update report that she provided to the coroner on 28 August 2013 -- do you want to look.

A. That one I would have to check.

Q. I am happy for you to do so. It is at tab 42, or do you have your own bundle there?

A. Unless I have missed one.

Q. It may be that it is worth using the coroner's bundle, because I will be referring to some of the pages within that. It is file 1 of the expert bundle. If you have notes or annotations which you want to refer to on your original reports then please do so.

A. Which tab was it?

Q. The update report is tab 42.

A. I believe the majority of that is Professor Simmonds's conclusions.

Q. The majority is from her?

A. Yes.

Q. Thank you.

She also answered some questions in response to issues that were put to her by the coroner, tab 43, did you have input into those?

A. No.

Q. No, that is Professor Simmonds?

A. Yes.

Q. Under tab 44, there are some answers to questions which were put by Surrey constabulary. To what extent did you have any input into the answers there?

A. I had no input into those.

Q. No input into those, thank you.

MR MOXON BROWNE: Can I ask Mr Skelton to give page numbers.

MR SKELTON: I am sorry, of course.

I am going through -- the answers were initially tab 43, page 245, then tab 44, page 249. Then next would be tab 46, page 253. This is an analysis of plant samples and samples of urine from Mr Perepilichnyy. You were involved I think with that analysis?

A. Yes, either report of the analysis, and these ones were subsequent questions to that analysis, which I did have input into.

Q. Yes. You had conducted that analysis in November 2015 at Kew?

A. That's correct, yes.

Q. Thank you.

Professor Simmonds provided some further answers to the court under tab 47?

A. Yes, I had input into those, yes.

Q. Sorry?

A. I had input into those.

Q. You had input into those, thank you, that is helpful.

Then you were party to a meeting of the plant specialists recently?

A. Yes.

Q. You had input into that as well?

A. Yes.

Q. Thank you.

A. There was one other report, I was asked some questions directly by the coroner, that is another report.

Q. This was in October 2016, was it?

A. That's it, 27 October 2016.

Q. Tab 49, which is in my different bundle, in my copy, just for clarification, page 366. These were specific questions for you?

A. That's right, yes, and it was dated 27 October 2016.

Q. Thank you.

Can I ask you just overall, do you stand by the conclusions and professional opinions that you expressed in the documents to which you had input and to which I have just referred?

A. Yes, only I have one concern about the statement, the final statement. There seems to be a slight contribution between standard proof of two identical statements, which might need some clarification.

Q. Yes, I will come on to that in due course and it may be because of the way the questions were posed rather than the way you have analysed them but we will probably come on to that at the end, if that's okay. Thank you.
A. Okay.
Q. Can I start by asking you to introduce the court to the terminology and the types of investigations and instruments that we will be talking about during the course of your evidence.
First of all, mass spectrometry or MS for short. It is an analytical technique which separates and identifies ionised molecules in short?
A. Yes.
Q. You use an instrument called what?
A. Well the only instrument used for this investigation was a liquid chromatograph mass spectrometer, and that was chosen because it was likely to have the widest range of coverage of plant compounds.
Q. Does that use a liquid gas --
A. No, it is not gas chromatography, it is liquid chromatography. It consists of two parts, the liquid chromatograph and the mass spectrometer. The liquid chromatograph, the key part is called the chromatography column, which is a metal tube packed with a solid, which is pumped with liquid. Your sample,

which usually contains numerous compounds, is injected into this flow of liquid, it goes through the columns and different compounds take different times to pass through the column, so one compound might take 15 minutes and another compound might take 5 minutes.
Q. Is that elution?
A. That is what is we refer to as the retention time or the elution time, the same thing.
Q. So the elution time or retention time are synonymous?
A. That's the same thing, yes.
Q. Why is that important?
A. In days gone past that was important because your -- the analytical capability of your detector on the end was limited, so that became quite a critical feature, or when mass spectrometers became available it dropped down the rank of importance.
Q. Could you explain what mass spectrometry does and why it is, as it were, a higher degree of analysis?
A. A mass spectrometer is basically a sophisticated weighing machine which gives you the weight of a molecule as molecular mass, that's it's basic function.
So the compounds from the liquid chromatograph pass into the mass spectrometer, obviously doing it sequentially because they are coming out at different times. One important factor to bear in mind in this

discussion is that a mass spectrometer cannot detect neutral molecules, a molecule has to carry a charge otherwise it cannot detect it.
Q. Does that mean it has to be ionised?
A. It has to be ionised, so your molecule then becomes an ion.
Q. You actively ionise the compounds as they go in --
A. The interface between the liquid chromatograph and the mass spectrometer is called the ion source, and that is what puts the electrical charge on the molecule.
Q. How do you do that, what are you adding?
A. It is sort of a semi-chemical reaction, the important point to remember is electrical charge has a mass, so it will change the mass of a molecule but various different types of electrical charge can be added to the molecule. The most common one is a hydrogen ion, which has a mass of 1. You could also add a sodium ion, which has a mass of 23 or an ammonium ion which has a mass of 18. The key point is that one molecule can generate more than one ion.
These ions are then basically weighed by the mass spectrometer, the mass spectrometer that we used is what is called a high resolution accurate mass machine, which means it can measure the weight of the ion to such an accuracy that you can genuinely calculate the ionic

formula in the first instance of what is weighed. That is a key piece of information in the first stage of trying to identify a compound.
The mass spectrometer we have also does something else, it can isolate the ions inside the mass spectrometer and fragment them. This produces a kind of fingerprint, it is analogous to a human fingerprint and the molecules must have the same fingerprint if they are the same molecule.
Q. What does the fingerprint look like?
A. It is fragments, the ion is broken up into fragments and each fragment is weighed and their abundance is measured.
Q. You may get the same weight in the total but the fragments are going to appear differently?
A. Sorry, can you rephrase that?
Q. It is probably easier than me using my GCSE chemistry rather than you explaining it. In terms of the fragmentation, explain what it adds to the MS data?
A. For example lots of plant compounds are what are termed glycosides, like they have got a bit of molecule with a sugar attached on it.
Q. Yes.
A. When you fragment that kind of ion inside the mass spectrometer, what you usually see is the sugar fall

off. So that can give you some kind of structural information on what the compound is, but other fragments you cannot interpret it, you are just using it as a fingerprint.

Q. When you are looking at the molecular structure you have to take into account the ionisation process, so you are deducting your hydrogen back off it?

A. That is what you are calculating the molecular formula. The first stage in the process is to work out what the instrument has added on to your molecule to create the ion. That can be the tricky part.

Q. Could you give me an idea of how many molecules you are likely to find of the same weight when you undertake this form of testing, compared to how many are likely to fragment at the same --

A. Plants are notorious for producing molecules of the same mass. The average extract of a plant which is what I do on a daily basis, you will almost be guaranteed to find two molecules of the same, not only the same weight but the same molecular formula. Plants have a habit of doing this.

Q. In terms of fragmentation?

A. They can often be the same as well. They can be very slight changes in the structure. The example I just noted about the glycoside, the sugar could be glucose or

lactose, in that case the initial fragmentation would be the same, the actual compound is very similar. If the compounds are different but have the same molecular formula we would expect the fragmentation to vary more.

Q. Why is that?

A. Because the structure and way the atoms are put together differs.

Q. Which means effectively they are different compounds?

A. Yes. Yes and they could also have different compounds which are structurally very similar. You can have left handed and right handed forms of a compound effectively. In the mass spectrometer they are effectively identical.

Q. Sorry, your voice dropped a bit there, I didn't catch the last bit you said.

A. I said the most similar compounds are left handed and right handed forms of a compound, as far as the mass spectrometry is concerned they are identical in terms of fragmentation.

Q. You refer in your report to M/Z values, what does that mean?

A. Well a mass spectrometer measures a mass to charge ratio. In all the examples I think we are looking at today the charge is always 1, so we can equate M/Z to the mass of ion, we don't have to worry about the charge. Sometimes you can have a charge of 2 on

a molecule but I don't think I ever saw these in these analyses.

Q. Just MS/MS --

A. That is the process of this fragmentation which I mentioned. An ion is isolated within the machine so all the other ions are removed and we are just left with the one ion. That basically our machine is shaken in helium and the ion breaks up and the mass spectrometer records the masses of all the fragments generated.

Q. Lastly the overall I have seen it termed LCUVMS analysis, so that is liquid chromatography, UV?

A. In our machine there is an ultraviolet absorption detector in between the liquid chromatograph and the mass spectrometer, but in these particular analyses the data that that generated was of no value, although it might be reproduced in some reports we don't refer to it.

Q. The UV in fact is redundant for these purposes, it is just the LCMS analysis that is important?

A. Yes, it is just a hassle to disconnect it so you go through it and the data is recorded.

Q. Thank you.

As far as the equipment goes, you have already explained the type of equipment you have got. To what standard is it accredited?

A. We have no formal accreditation, you work to obviously scientific research standards, we have to publish our research so it would be done to that standard.

Q. Within the academic community of professional scientists publishing in reputable journals there has to be a certain guarantee of the quality of your equipment and its validation?

A. The most important thing about this machine is that the masses are calibrated accurately. It is fairly obvious to an expert who could look at a file and probably see that the instrument was not calibrated correctly, so it is almost self checking. The instrument is calibrated once a week or more than once a week.

Q. There is a regular form of calibration within the machine to check that it is producing accurate masses?

A. Yes, I mean you have to do it, you do the calibration, it is done automatically by a machine.

Q. How is that process undertaken, do you do repeated compounds or is there a single compound that you test to check?

A. No, there is a test mixture of compounds with known accurate masses which you infuse to the mass spectrometer and the mass spectrometer does the rest, it calibrates them, it knows what the masses should be so it makes sure it is recording the masses what they

should be, but they are within an error.
Q. Just breaking that down, how many compounds are in the mixture that you are testing, roughly?
A. Probably about -- I think it is about five ions across the range -- there is actually more ions in the mixture but I think we use about five of them across the mass range of the instrument.
Q. Five ions go in, the mass of which you know in advance, and the machine produces a result and you need to ensure it is within five -- what the range of variation that you are prepared to accept as being --
A. Certainly five parts per million.
Q. Five parts per million?
A. Yes, that is your relative error so the larger the molecule, the larger the absolute error that is allowed. The smaller the molecule, the smaller the absolute error.
Q. As far as you were aware, what is the difference between the quality of your testing, when it comes to mass for example, at Kew, compared to a commercial laboratory that may have a form of commercial accreditation?
A. Well I believe accreditation is more important if you are doing quantitative work. Their procedures are set down.
Q. Could you explain what kind of quantitative work is

compared to qualitative work?
A. Quantitative, you want to know how much, particularly in a drug testing, athletes and drugs, you want to know how much of the drug is whether.
Q. As opposed to whether the drug is there?
A. As opposed to whether it is there.
Q. Is there any reason to doubt that your conclusions on the analyses that you did would somehow not be replicated by a different laboratory with a different form of accreditation?
A. No, no.
Q. At Kew, you are obviously a specialist in plants, you also hold a database or library of plant compounds which you can test against?
A. These are the MS/MS spectrum.
Q. You hold MS/MS spectrum so when the results come out of the machine you can start comparing?
A. Yes.
Q. Is it right you are not going to identify every single compound in the plant?
A. Certainly not. If you look into the scientific literature that is the big issue at the moment, the bottleneck of identifying compounds. An average plant, I don't know, it could contain 200 compounds that would give about well over 1,000 what we call chromatographic

features. If you can identify 20 to 30 of those, that is the state of the art.
Q. Sorry, 20 to 30 of the features?
A. The compounds.
Q. Of the compounds, out of 200?
A. Yes, it is a very low level at the moment and plants is lagging behind --
Q. So 10 to 15 per cent of the compounds you are hopeful to identify, but a huge percentage you are likely not to?
A. Yes, I mean there are people who specialise in analysing human urine, they would have a higher level of identification because not so many compounds occur in human urine, typically. But with plants we are at the bottom of the field at the moment, because plants produce an awful lot of compounds, maybe 0.5 million, probably 1 million compounds so the chance of identifying all those compounds, we are a long way away yet.
Q. In terms of variation between results, over periods of time, if you change your machine, and you change the column I think in this case in your machine?
A. Yes, certainly once a year, twice a year the column is changed.
Q. Between 2013 and 2015 there was a change of machinery. What difference does that make to the data that you are

receiving and how do you take that into account? Presumably the mass issue doesn't change because you are calibrating --
A. No, mass never changes.
Q. It cannot change because it is constantly being calibrated. What other aspects of the data are potentially changing?
A. If you are in a situation where retention time becomes critical, then in those situations the two comparative analyses should be done at the same time. If it is even more critical, you mix the two samples and run them together.
Q. In terms of how conclusions are reached on the kind of testing that you have conducted in this case, you have elution retention times extracted by chromatography, that is one aspect of the data?
A. Yes.
Q. You have comparison of molecular weights measured by mass spectrometry?
A. Yes.
Q. You have fragmentation characteristics established by the MS/MS data in differentiating compounds; is that right?
A. Yes.
Q. Can you prioritise those for me, if that is appropriate,

in terms of what is the most important from your perspective?

A. Well, the first thing you need to do is to assign what you believe to be the molecular weight of compound in general terms. That has to be the same as your target compound. Having assigned it, you then need to assign the molecular formula because that has to be the same as your compound that you are comparing it with. So it might be the top level, it has not got the same molecular formula in no way could it be the same compound.

The next one is to look at the fragmentation spectrum, these MS/MS fingerprints I would say, that must be the same within certain bounds. Only once you have fulfilled those two, you then look at retention time. If the two MS/MS fingerprints are different, the retention time data is not really relevant.

Q. It falls away in terms of its significance?

A. Yes.

Q. Do you need all three to match before you are confident on identification?

A. If you are getting matching on molecular formula, you move down to the MS/MS spectrum. If you are getting matching on the MS/MS spectrum then you need to fall down to matching the retention time.

Q. If you have all three?

A. With this particular technique that is as good as you are going to get.

Q. If you don't get all three?

A. You work down, if the MS/MS spectrum are not matching, it is almost irrelevant when the retention time matches or not, or it is irrelevant, not almost irrelevant. It is irrelevant.

Q. If you don't match the first one the other two become irrelevant?

A. Yes, and if you don't match the second one the third one becomes irrelevant.

Q. Do you need the third one?

A. Only if the two first match, but it is always useful to quote all three.

Historically a lot of emphasis has been placed on retention times, which is why still nowadays people tend to quote them, even when they are not needed.

Q. Thank you.

A. I should say there are some people that don't even bother to put their samples through a chromatography column, the sample just goes straight into the mass spectrometer but I prefer to put our samples through a chromatography column because it gives the mass spectrometer more time to work. It is not having to

work so hard because it has time to do things.

Q. Could you explain how you went about processing the initial samples that you received and just going back to your report, to page 230, the initial analysis from May 2013.

A. I mean the sample preparation was minimal.

Q. Just for clarification, you received stomach contents, duodenal contents, jejunal contents, ileal contents, blood frozen and also chopped leaves said to be sorrel and some gelsemium sempervirens root?

A. No, I never received the gelsemium, I acquired that after from I got -- from seeing some results.

Q. Yes. Sorry, I interrupted you. If you then explain what process you went through in terms of conducting the LCMS analysis?

A. The sample preparation was minimal because most of the gut contents were in a frozen liquid, they had been in the freezer so they were in liquid form with just some small particular material in there. So I just added some ethanol to improve extraction from the particulate matter, which was in the matter of clarifying it and injecting it straight into the machine.

Q. On page 231 you explain on your analytical notes what you found, so the minor --

A. Yes, initially with this data, it is very difficult to

reproduce the data on a piece of paper, because generally you interrogate the data with various questions in mind. What we would have done initially is to look at just replicate what we do on a day-to-day basis with plants, look at the major peaks, major chromatographic features and see if we can identify them or see if there is anything suspicious about them that might be suspicious and so I just went through each peak manually as best I could.

Q. Just to go back to explain the way the peaks, this is in a graphic is it?

A. In graphs.

Q. You actually see, if you look overleaf, you are looking over the spikes, the peaks?

A. The spikes, the peaks, yes.

Q. Each of those is something to look at more closely?

A. I mean a compound would have produced --

Q. Sorry?

A. A compound must have been responsible for producing that large peak at this level.

Q. Can one attach significance to the size of the peak?

A. Well there is a rule of thumb, the bigger the peak, the more compound, not strictly true because some compounds ionise better than others, so the equivalent amount of two compounds can produce two different sized peaks.

Q. Then looking at the final large paragraph on page 231, you explain that:

"The minor components in the stomach contents were examined in detail by computerised extraction of ion peaks and matching of accurate masses with those in a list of 102 poisonous compounds from 36 poisonous plant species."

A. Yes, I mean having gone through this process of looking at the data manually which is usually the level we go to, I was getting not very far at all with finding anything of any significance, normally these equipments are used to -- normally an analyst would be told, "does this compound, or these compounds occur in this sample?"

Obviously I was just told, "can you find anything?"

Q. Find something?

A. Yes, that is all I was told. I should say at the time when I did these analyses I had no background information to this case whatsoever, it was just a sample.

Q. Although you knew that sorrel was a potential --

A. That was -- one of the things was called a jar of sorrel.

Q. Yes.

A. Having done this, which was the level which we usually applied to, I thought it would be a bit more detailed if

we can just accumulate the molecular weights of a list of toxic plant compounds. So I consulted a book by two very well known plant chemists, Michael Wink and Ben-Erik van Wyk, who produced a book on "Mind Altering and Poisonous Plants of the World". In the back of that they list all the poisonous plants' compounds, not only that, they rank them into their level of toxicity. So I took from that the ones that they ranked as being the most toxic, and that gave me this list of about 120 or so compounds so I had their masses.

Q. From 36 species?

A. From 36 species, yes.

Q. You went through those manually?

A. No, that would take too long, so then we had to use a computerised approach.

From the masses I calculated the expected accurate values on the protonated ion, the ammoniated ion and the sodiated ion, so that is giving now about 360 masses. Then there is a piece of software that extracts from the data file the masses detected by the machine and it matches those with the masses in the list to within 55 ppm and tells you if there is a match.

Q. Having done that, is that how you get your nine hits?

A. We have got nine hits. Then they have to be investigated manually.

Q. You then look at the manually and all but one is eliminated?

A. Yes, because the other eight, the ions were not the same, it is like an ammoniated ion in the list was matching with a protonated ion from the machine, so you are matching an apple with a pear, it can't be the same thing.

The only one that was convincing was this one that was left.

Q. You then do find an ion with the formula we can see, C20H27N204 occurring at 6.9 minutes, so that is a molecule you have?

A. No, it is an ion.

Q. It is an ion?

A. At this stage it is an ion.

Q. At this stage can you tell what the molecule is?

A. The analyst has to convert that ion into a molecule, that is the tricky bit.

Q. How do you do that?

A. You have to assign the ion you have got, in this case the ion was accompanied by another ion which was 22 mass against a part. To me that looked like a protonated ion and a sodiated ion. Which I could give an initial guess of what M might be. My initial assumption that M was 358.

Q. That is a deduction which is not computerised, is that your analysis of it?

A. That is a deduction of it, yes.

Q. A deduction?

A. I have to say that modern software is now available which does that deduction for you, but at the time we never had that software.

Q. Out of interest, have you ever used the software to check this result?

A. Yes.

Q. What was it?

A. It said the metal weight was 180.

Q. Could you repeat that answer?

A. It said the metal weight was 180.

THE CORONER: 180.

MR SKELTON: Which is a little over half what you had calculated.

A. The metal weight was 179, the ion was 180.

Q. Indeed.

A. The things about ions and molecules is always a confusion.

Q. Yes, so you were right?

A. In my initial thing I was wrong, because I had assigned that 359 as a protonated molecule, so in that case that was a misassignment.

Q. You have come to a view later about the reason why you have misassigned it, what do you think is the reason?
A. The machine was scanning from 250 upwards so in the high resolution mode, so actually the ion at 180 was not visible at that stage in the high resolution data. And I think having gone through this computerised approach, you found a match and then I just went to the standard method of finding out if this match was really a compound by comparing it with a standard. We didn't have a standard available, so I used the next best thing, which was a plant which produces the compound. That is the ultimate way of proving that what you have as a signal is or is not the compound.
Q. In terms of your conclusions as to whether or not that was an alkaloid from gelsemium, could you explain how you undertook the analysis of that?
A. I looked up where -- the match of this is a particular alkaloid called gelsemicine, so I looked up what the source of that plant, which was gelsemium sempervirens.
Q. That is the one that you had at Kew already?
A. Yes, it suggested it was a major alkaloid in gelsemium sempervirens. I went and got a sample of the root, it was from the root of gelsempervine so I got a sample from the Kew collections, extracted it, analysed it and then identified -- back to isomers, there were two

compounds of the plant which could be gelsemicine so I assumed one was gelsemicine and one was an isomer.
Q. I haven't asked you about the word or term "isomer", what does that mean?
A. It is tricky, it is any compound that has the same molecular formula.
Q. Of which there may be multiple isomers?
A. Yes. Yes.
Q. Figure 6, if you look at that, page 237, could you explain the two different graphs we have there?
A. The first, the top trace is basically looking at all the ions, the machine is just basically measuring the number of all the ions. From that you can pull out ions of a specific mass, so the trace below that is just the occurrence of ions of that specific mass, which 359.1965. You see there has to be two main compounds.
Q. Could you just explain what is the material that you are looking at here that has produced this graph?
A. That is the root of gelsemium sempervirens, it has been extracted in aqueous ethanol.
Q. You are trying to isolate within that --
A. I am trying to find -- because gelsemium was reported as a major alkaloid in that plant, and I am trying to find it amongst all the other alkaloids that are occurring in that plant.

Q. You are processing it through to isolate the substance which could be toxic within the plant material?
A. Just to locate it in the analysis, because obviously the plant contains a number of different types of gelsemium alkaloids and I am trying to find the gelsemicine.
Q. We have two graphs here, could you explain the difference between the two then?
A. What do you mean by the two graphs, the two inserts?
Q. The two inserts, I am sorry.
A. The two inserts are the MS/MS spectra of the ion at 359. Those were the fragments that they produce. You can see they have different fragmentation, those two isomers, I do not know which of those isomers is gelsemicine.
Q. You don't know from the data you have received you don't know which one is?
A. No.
Q. Is there any way of assessing that?
A. Probably not with that degree of fragmentation, no.
Q. One of them is though, but you don't know which one?
A. As likely as not, one of them is. The literature said that gelsemicine was a major alkaloid, I am not expecting the gelsemicine to be a minor peak somewhere in that particular sample.
Q. Then you are comparing what you find from these isomers are you with the compound that you found in the stomach?

A. Yes, so the lower trace is a stomach analysis and the insert there is the MS/MS spectrum of the ion at 359 again. So you can see that it is different from either of the two compounds --
Q. Could you explain specifically what the difference is and how significant that difference is?
A. Well, the compound in the stomach produces a major ion of 180, and there is no such ion in either of the two spectra from the plant.
Q. Is that the fingerprint issue?
A. Yes.
Q. You have effectively a different molecular fingerprint?
A. Yes. I mean because that 180 is the base ion, it is pretty significant.
Q. Does that mean when you are then going back to consider whether or not to carry on with the further forms of analysis, that you have failed at the first hurdle, is that definitive?
A. You have failed the second hurdle.
Q. You failed the second hurdle, sorry, so you have got an answer already without needing to look at the other data?
A. Yes. Yes.
Q. Professor Simmonds summarises by saying the signal was associated with the mass of a compound in traces that

could be associated with toxic alkaloids found in gelsemium, so this is the gelsemicine, then analysed the chemistry of the plant, sempervirens and the date it didn't match, which is what you have just explained. You concluded it cannot be an alkaloid of gelsemium?

A. I concluded it can't be, yes, gelsemicine.

Q. Conclusively?

A. Yes.

Q. Is that a conclusion that you have reached beyond reasonable doubt or on the balance of probabilities?

A. I would say it is beyond reasonable doubt.

Q. Why do you say that?

A. On the basis that you have would have the presumption that one of the peaks I am looking at is the gelsemicine but neither of them, it doesn't matter which one of them is the gelsemicine, neither of them has the mass spectrum of the compound in the stomach contents.

Q. As far as you are aware, could the compound be an unknown toxin?

A. You cannot comment on that.

Q. I think you described earlier that there are multiple compounds which you cannot identify when you do these sorts of tests?

A. Yes, I mean we are looking at stomach contents now which I am not familiar with. I presume a stomach would

contain digested proteins, certainly the major compounds in the stomach analysis were amino acids from protein digestion, so there could be peptides or anything else in there, which are not listed as plant compounds which is why they were not giving me matches.

Q. It could be a plant compound or it could be a human compound from stomach contents?

A. Yes, I don't know if anyone who specialised in stomach content it is a rather difficult thing to study, it could well be a very common compound found in the digestive part of a stomach.

Q. Further work was undertaken by your laboratory because it became apparent that there were other forms of gelsemium, gelsemium elegans in particular?

A. I think there was a period of about a year when this went into the distant past then I was asked by Professor Simmonds to -- she provided her samples of gelsemium and she said do any of the alkaloids in these samples occur in the stomach contents or a new sample of urine that had arrived.

Q. Did you in effect you conduct the same exercise with elegans as you had done with sempervirens later?

A. It was slightly different, the analysis of the gelsemium samples again revealed the fact that these plants contained numerous alkaloids at fairly high abundance.

In this case, I decided to take the data from the machine to generate the list of compounds in gelsemium. I basically combined every single sample of these gelsemium extracts and from that compiled a very long mass list of all the masses that have been found in these extracts, and then did the matching of the masses with the samples.

Q. Just to look at the report that I think you have produced, the analysis of plant sample and urine samples. Is this the one dated 10 December and under tab 45, page 253?

A. Yes.

Q. The request was made by the coroner's office to evaluate whether the stomach sample of Mr Perepilichnyy contained tax toxic compounds from species of gelsemium and whether the urine samples contained toxins, so those are the two tasks?

A. Yes.

Q. You obtained elegans, where did you get the elegans from?

A. These were gathered by Professor Simmonds she just gave me all the samples. I had not had sight of the question other than being communicated by Professor Simmonds, who asked me: does any of the alkaloids in these gelsemium samples occur in the stomach contents or the urine?

Q. You also I think had obtained further sempervirens; is that correct?

A. Sorry?

Q. You would also have had further sempervirens for the testing?

A. Further sempervirens, yes.

Q. You had elegans, you had sempervirens, there is one called gelsemium rankinii, do you know anything about that?

A. I think it is not of a common species and I am presuming that Kew does not have a sample of it, at least the roots.

Q. You conducted further analysis and your conclusion was highly the urine samples were containing intact alkaloids as it would be broken down, so there is a timing issue by the time you are looking at the sample in terms of looking for alkaloids?

A. Yes.

Q. What is the timeframe that allows for reliable testing of those sorts of chemicals within urine?

A. Which report -- is that a report from me or Professor Simmonds?

Q. To some extent it is difficult to see, if it's Professor Simmonds's view then please do clarify but she produces an additional two-page report but I think it is

based on your analysis and it may be that she has simply taken that conclusion herself. She reaches that conclusion on page 254, it is the last paragraph of her report:

"Highly unlikely urine samples would contain the intact alkaloids because they would most likely be broken down."

A. I mean I am not an expert on toxicology or human metabolism, but it is highly likely that the human metabolism or the liver will break down toxic compounds as a general statement. I cannot be more specific than that.

Q. You did however test the urine?

A. Yes.

Q. You found one sample contained an ion 259.1965?

A. Yes, that was from specifically looking for that ion it, didn't come out of the mass spectering because its level was too low to be recognised.

Q. You were actively looking for it?

A. I was actively looking for this ion.

Q. The report explains or Professor Simmonds explains that further analysis showed that that was a spurious finding, could you explain why that is the case? If you need to make reference to the various figures that are appended to your own analysis, which you can see from

page 258 --

A. Yes.

Q. -- onwards?

A. This ion was at such low levels it was very difficult to get any kind of positive information on it, even to try and ascertain what kind of ion it was. If it was a protonated molecule at 359, then all we have got to go on there is a retention time, which is wildly different from those in the gelsemium samples.

Q. Could you show me specifically where that -- because you said -- she writes, "This finding was spurious". What happened for you to decide that was, or for her to take that view?

MR MOXON BROWNE: I hesitate to interrupt, but these questions are being put on a false basis.

Professor Simmonds describes this as spurious. Dr Kite says, as I understand it, it is an entirely genuine finding, it is simply that he doesn't think it is relevant for various reasons. To try to persuade him that he has said that the ion is spurious seems to me unfair and unhelpful.

A. I don't remember using the word "spurious" in that relationship. There was a spurious matching between matches, when I used the word spurious.

MR SKELTON: Could you explain why that is the case?

A. That is because the mass list was derived from a real sample and in nature, most carbons have a mass of 12, but one in 100 carbons has a mass of 13, obviously increasing the mass of a molecule by 1. I had a mass between a mass on my mass list which corresponded to an ion which contained a carbon 13 atom, to a mass on the stomach content list which didn't, so it is apples and pears again. It was just a coincidence -- it was a spurious match.

Q. Could you show me the table in which that appears?

A. It is not a table, it was written in the report. It is in the report, it is my experimental report dated on 25 November 2015.

Q. If you look on page 257, if you could just talk me through how you analyse the data to get to that conclusion that you just expressed and what the actual figures are so that we are clear about what we are talking about. You say, "Contained one ion within five ppm of 259.1965".

A. This ion of 360.2034, so in the mass list extracted from the gelsemium sample, that ion contained a carbon 13 atom. In the urine sample, that ion didn't.

Q. So it can't be the same?

A. It can't be the same.

Q. The retention time, is there a significance about that

on your analysis?

A. The retention time was quite long, was it 21.5 minutes?

Q. 21.50?

A. That is almost at the end of the analysis where the column is being washed, yes, compounds do elute, these type alkaloids to elute before then. I gave the other factor was that ion is extremely minute.

Q. What is the significance of the size of it?

A. Well I guess it is to do with the toxicity of compounds, all compounds are -- most compounds high enough level and every compound has a toxicity level, and you just get the feeling that that level of compound is, even if it were from a hypothetical states a toxic compound, the level is just so low that it would not have any effect.

Q. Thank you. You clarified or provided some written answers dated 1 February, which we can find at 265 and that includes I think a table which I would like you to look at if you would, please.

This time it is unquestionably from both you and Professor Simmonds so I don't think there can be any objection to your signing up to the conclusions.

You were asked to explain again your position. Could you explain the key conclusion that you are reasserting here, please?

A. Well I think we were asked to show the distribution of

alkaloids in gelsemium that produced an ion at 359 amongst all samples, so we were just focusing on that ion. I tried to group them together where I considered that each peak in each analysis was probably the same compound, that is why they are in four groups so we have four possible isomers.

Q. There is a table actually quite handily which shows the four isomers, do you have that on page 276?

A. I have my original copy, which has the name of the plant on, which I don't think the table in the evidence has, they are chopped off the end, aren't they?

Q. Yes, we have actually reproduced a version --

A. I've got mine.

Q. You have one with the full amounts, thank you.

This is attachment 2 to your report, dated 1 February 2016. It records:

"The M/Z values of protonated molecules at maximum peak height, retention times, MS/MS ions, ND [being no data] and chromatographic peak areas of four likely isomers of gelsemicine amongst gelsemium samples examined."

You have covered all four isomers of which isomer 4 is probably gelsemicine?

A. Yes, on the basis it is the largest peak in gelsemium sempervirens.

Q. There is reference down the left-hand side, the top half is referring to elegans, the bottom half is referring to sempervirens.

A. Yes.

Q. Is there a preponderance between the two, is there more of one than the other when it comes to this comparison?

A. This last isomer was more abundant in sempervirens than elegans.

Q. When you say that, that is based on the fact that you can see the M/Z data, in fact all the data for those isomers, isomer 4?

A. The last figure in the table, I measured the peak area so that last figure, column 4 of each column is a relative peak area, so you can see they are in -- a lot of them in the thousands and some with a small amount. If you look at the similar data in the other two lines, they are generally much less.

Q. There are nine sets of data there and there are two for elegans based on the I think it is the fruit wall and the root bark?

A. Yes, so we detected it in two samples.

Q. Can you explain how significant this is when it comes to determining whether or not what you had found, the compound, the unknown compound, isn't gelsemicine or an isomer or isomer 4?

A. I think we were asked to do this on our questions, so this is what we did. The significance to me is I did jot down on the mass spectra of whether it has been recorded, so we got quite a few now MS/MS spectra which are sort of annotated in these tables giving the major and in some cases the only ions, and still nothing has the same spectrum as the compound, as the ion in the stomach contents.

Q. The MS/MS spectra is 328?

A. Yes, so there is just one ion of 328 and there is a slash there.

Q. In every case?

A. Now, some have two ions, 328/297 so there was two ions in that MS/MS spectrum.

Q. You are looking at isomer 3, I was looking at isomer 4.

A. I was scanning through all the isomers in total.

Q. Understood and the significance of the "/297" is?

A. That is just two ions.

Q. Two ions. In isomer 4, which you have said is probably gelsemium, it is 328 consistently?

A. There is just one major ion, yes.

Q. One major ion.

Thank you.

A. But that a bit reversed, because I was using the MS/MS spectra to try and line up the peaks, so you are on a bit of a circular argument.

Q. If you compare that with your original analysis back in 2013, at page 236, have you come full circle in terms of your conclusions?

A. Yes, basically, yes.

Q. If you look at the figure 6 there, that I have taken you to, you can see 328, 328?

A. Yes, those are the two main types of mass spectrum.

Q. Yes.

A. Yes.

Q. And you have 328/297?

A. Yes.

Q. In terms of what you are concluding by reference to the isomers that see on that other table, the horizontal table, what does it look like you have on that original data?

A. It looks like I am back to the same conclusion I had originally.

Q. You have isomer 3 and isomer 4 potentially?

A. Sorry, I have lost -- can you just --

Q. In terms of if you go back to the 2013 table, do you have the same results as recorded later on this table, the latter table?

A. Yes.

Q. Sorry, just to clarify, that isn't the same as the

stomach compound?
A. Yes.
Q. You have already said I think beyond reasonable doubt when it came to your original conclusions, does this confirm that position?
A. Yes, it confirms that position.
Q. Can I ask you just to comment on the paper by Nardin, please, which I think you have seen, it will be in bundle 3, tab 88, page 732.
A. I think I must have the wrong bundle here, I do not have a tab 88.
THE CORONER: File 2, not 3. It is 2. Yes.
A. I do not have it. That is not the Nardin paper.
MR SKELTON: That is it by the looks of it, I think. It is printed horizontally.
THE CORONER: Do you have that?
MR SKELTON: Do you see that, Dr Kite. Do you want to take a moment just to look at it.
A. It is not the Nardin paper as I remember it. It looks like someone has adduced a set of data from the paper.
Q. It is data from the paper.
A. Yes.
Q. Do you need the full paper which you can find I think at further --
A. I may do.

Q. 715 if you want to look at the full paper rather than the results in the table but we may need to come back to the table which is on page 734.
715, this is --
A. Yes, I have it, yes.
Q. What is the significance of the findings made in the Nardin paper when it comes to your determination of whether or not what you found was gelsemicine?
A. I believe in some questions to me it was pointed out that one of the alkaloids in gelsemium --
Q. I can't quite hear you sorry, Dr Kite.
A. In some questions that were put to me in writing it was pointed out that one of the alkaloids in gelsemium in this MS/MS spectrum it produced a fragment at 180.
Q. Yes.
A. That was -- I am trying to find it now. It is gelsempervine --
Q. Gelsempervine. Do you want to look at the table on page 722, it is a complicated paper and we are adding complexity to an already very complicated picture, I know --
THE CORONER: 722.
MR SKELTON: If you look on 722 you should see at the bottom reference to gelsempervine A and I think it is gelsempervine C.

A. It was pointed out to me that it was a gelsemium alkaloid that was producing a fragment following MS/MS of 180.
Q. Yes.
MR MOXON BROWNE: The same point is made very much more clearly on 721, it might be helpful for the witness to look at that. The boxes at the bottom.
MR SKELTON: There is reference there to gelsempervine and gelsemicine, I am afraid my copy is not sufficiently clear to read the numbers very readily I am afraid.
A. The comment I made on this was that gelsempervine does not have the same molecular formula as gelsemicine, so you have failed the first hurdle again.
Q. Back to the point you made right at the start, when you go through your criteria?
A. Yes, if you failed the first hurdle, there is no point looking at MS/MS spectra.
Q. It simply doesn't matter?
A. No.
Q. You, I think --
THE CORONER: Did you want to add something?
No.
A. I think what the question was getting at is it is possible that a gelsemium alkaloid could produce a fragment of 180, but I don't really -- it could.

I don't know what the significance of that is.
MR SKELTON: You don't know?
A. I can't place any significance on that.
Q. Because?
A. It could.
Q. But the mass, the MS/MS is different?
A. It is not that compound.
Q. I understand.
As far as that data is concerned then, is it of any relevance to your conclusions?
A. No.
I should point the mass spectra they show in this paper were acquired on a different type of mass spectrometer to ours. There are two types of MS/MS spectra broadly, our ones are called ion trap MS/MS spectra. They are fairly consistent and they tend to be fragment poor, but they don't vary with collision energy and I know from experience you can go to someone else's instrument and the spectrum will be more or less the same. These were produced on a collision cell instrument, so they are collision cell MS/MS, they tend to be more fragment rich but if you change the energy the spectrum changes. So for producing (inaudible) fingerprints the ion trap tends to be the better option, so it is pros and cons between both.

Q. It is a different type of investigation?
A. It is a different type of MS/MS machine, which is why the gelsemicine spectrum on the Nardin paper is not the same as the spectrum in my results, because they have a different way of producing the MS/MS spectrum.
MR SKELTON: Thank you.
Sir, we have a short break.
THE CORONER: Yes.
MR MOXON BROWNE: Sir, before you rise, just looking ahead, the combination of the fact that I am becoming rather hard of hearing and the fact that this witness has a problem is making it seriously difficult for me. I was wondering if you would permit me to ask my questions from the jury box.
THE CORONER: I certainly will. If you want to sit nearer for the evidence.
MR MOXON BROWNE: I thought if I went over there then when it was my turn, I will be there.
THE CORONER: Yes, you will be there and ready to spring.
MR MOXON BROWNE: I am very much obliged.
THE CORONER: Thank you.
(3.55 pm)
(A short adjournment)
(4.12 pm)
MR SKELTON: Doctor, I have one last issue to address you

with you, I tried to touch upon it earlier and I am afraid I did it rather obliquely, but I would like to come back to it directly. The issue of the cluster molecule. Could you first explain to the court what a cluster molecule is?
A. A cluster molecule is two molecules associated with each other but not via a chemical bond. It is a weak bond. The typical one if you can remember chemistry at school is a hydrogen bond, so two molecules can associate with each other via a hydrogen bond so they form a cluster of two molecules.
Q. How commonly often do you come across cluster molecules when you are undertaking the type of tests that you undertook here?
A. They are pretty common, yes, but in our normal routine work we are looking at big peaks manually, so the cluster would be a small peak up there, so you don't really pay much attention to it.
Q. You I think have formed the view that what you found is likely to have been a cluster molecule?
A. Yes.
Q. Could you explain the confidence with which you hold that view. You have previously expressed the view in respect to gelsemicine that beyond reasonable doubt whatever was found was not gelsemicine. When it comes

to the identification of what you think may be a cluster molecule, are you as confident as that or is it more on the balance of probabilities?
A. I am confident it is a cluster.
THE CORONER: You are confident it is a cluster?
A. Yes.
MR SKELTON: How confident are you?
A. It is based on one is sort of mathematics, the formula of the ion at 180 agrees with it being the N plus one and the one at 359 had been a cluster the formula add up, it makes sense.
The second thing is both these ions exactly coelute, if they were two different compounds then okay they could coelute but then we have an coincidence of mathematics and two ions coeluting. Also from the MS/MS spectrum there is a bit of mystery here, because we are looking at quite small ions it is quite difficult to get a very pure MS/MS spectrum. In one of the reports I wrote I think in October 2016, I did acquire a pure MS/MS spectrum of the 359 and it basically just broke down to the 180 and that gives an indication of cluster ions, there were no intermediate ions, it just looked like a molecule just breaking into two. That is a third line of evidence that I looked at.
Q. There is no intermediate ions, by which you mean?

A. When you fragment a molecule, the weakest bond will break first. If you have got this very weak interaction between two molecules that is going to break first, that is going to absorb most of the energy. It is unlikely a chemical bond will break before a weak interaction to produce an intermediate ion.
Q. That break is a clean break; is that significant?
A. I don't think that term "clean break" has any meaning in this context I think.
Q. Thank you, so just so to summarise the formula itself --
THE CORONER: That may be another way of putting this thing about there is no intermediate ions, it is just like a molecule breaking into two.
A. It is not a molecule breaking into two, it is an interaction between two molecules, the interaction being --
MR SKELTON: They separated?
A. Yes, there is no chemical bond between the two molecules. The molecule is a smaller one, the big one is not a molecule, it is a cluster of two smaller molecules.
Q. The coelution time and the MS/MS?
A. Yes, and the agreement of all the formula.
Q. If you are wrong, do you nevertheless stand by the opinion that it is not gelsemicine?

A. Yes, because originally I took the classical approach of trying to find out whether this signal that we had found was or wasn't gelsemicine and I took the exacted approach of running it against the standard, which is the usual way you do things.
Q. To confirm, the coelution was the same on the original testing and subsequently?
A. Yes, in the background, if I could explain, in the background a machine is recording a low resolution spectrum which had the full scan of ions in it. It was only in the high resolution scan they were restricted to 250 in the original analysis. I can explain why that was, if we need to go down that path.
Q. No.
There is an issue about the type of peak that you see on the testing, and I am going to again probably use a word that is not appropriate but the purity of the peak as opposed to a spread peak, does that --
A. Do you mean the shape of the peak?
Q. Yes. Is that of significance in this context?
A. Yes, but then you are into the world of someone's experience and intuition. Ideally, a compound should not have an adverse interaction with the chromatography column as it goes through. In that case you should have a very nice symmetrical sharp peak, as we got for the

peaks in the stomach contents.
Alkaloids, some of them are rather difficult compounds to analyse they can convert between two like forms and from a mixture and the other two forms can have different retention times, so as it is going through the column it is converting backwards and forwards between two forms and you can get a very unsatisfactorily peak shape either a broad peak or sometimes even a double peak, one representing each form. Just by looking at data, and your experience, I have a peak in the stomach contents which is a beautiful peak and the gelsemium alkaloids some of them are producing not very good peak shapes, so even just looking at peak shapes but it is a feeling you cannot put numbers on it or anything like that.
THE CORONER: In the way that -- yes.
A. It is a feeling, it is an analysis.
MR SKELTON: To clarify, you don't need that feeling to give you the answer but it confirms the answer you have already --
A. Yes, it is another aspect of, yes, just to clarify I had to analyse the gelsemium in the same way as stomach contents. If I was on a project where I had to optimise the analysis of gelsemium alkaloids I would work on the chromatography to try and get good peak shapes, but that

was not necessary for this study.
Q. Is it fair to say in summary that you are sure that Mr Perepilichnyy did not have gelsemicine in the samples that you found?
A. I am sure that the analytical data as sampled shows there was not gelsemicine.
MR SKELTON: Thank you.
Questions from MR MOXON BROWNE
MR MOXON BROWNE: You do appreciate don't you, Dr Kite, that the issue in this case for the coroner is probably not whether the unidentified ion is gelsemicine, but whether it might be a product of gelsemium, which is a slightly different thing, isn't it?
A. Yes.
Q. Yes. The proposition which Mr Skelton has on a number of occasions elicited from you that you are very sure it is not gelsemicine tells us nothing about your or indeed Professor Simmonds's view about what else it might be?
A. Yes.
Q. Yes.
Can you just clarify for me the areas of expertise that you and Professor Simmonds have. She is a very distinguished plant chemist, and she obviously also has knowledge and familiarity with mass spectrometry techniques, but is her knowledge in that department more

than just general or is she really quite expert?
A. In mass spectrometry I would say it was general.
Q. General knowledge?
A. Yes.
Q. Looking at it from the other end of the telescope, you are obviously extremely expert in mass spectrometry, I notice that you have a qualification in botany, are you also a plant chemist?
A. It is my identity -- I have used mass spectrometry in my research at Kew to do the (Inaudible) my job, comparative plant chemistry --
Q. You are probably both, you are a spectrometry expert and a bit of a plant expert as well?
A. But I don't specialise in toxic plant compounds.
Q. Nor does Professor Simmonds.
THE CORONER: Can I just check one thing.
Jo, did we get anywhere with the lapel microphone or not?
THE USHER: It doesn't work.
THE CORONER: Not to worry.
MR MOXON BROWNE: What you have to try and do is to listen to me but talk to there.
THE CORONER: If you can, it just means there is more chance of more than one person hearing.
Yes.

MR MOXON BROWNE: I just want to pick up a point of detail before we get into it. This point about the spurious ion. Just set that in context, when you did your first lot of tests right at the beginning of this story, you found an unidentified peak at 359.1965.
A. Yes.
Q. When much later -- that was out of the stomach contents?
A. Yes.
Q. Which were pretty sparse. Much, much later, years later, in 2016, you for the first time got some urine, in fact you got two lots of urine, one Mr Perepilichnyy's urine and one vial full of that urine diluted times ten with the addition of some nitric acid, you remember that?
A. Yes.
Q. In relation to the first of those, that is to say the genuine sample of urine, you located an ion at 1658, very, very close to the original one?
A. Yes.
Q. Very far from concluding that it was spurious, you gave it pride of place in your report. If we look at page 261 of what I am going to call "Core bundle 1".
That is the table which records at the top the stomach contents that you have done in 2013, at 359.1965 and then what you got out of urine 1, which was 359.1968

so it was an extremely close match.
Albeit eluting at quite different time, 21.50, that's right?
A. That's right, yes.
Q. You didn't think that was a spurious finding, there were some spurious findings from the urine, I think there were five, but you found those five in the black, so you knew that they were spurious, and you so described them.
But this one wasn't spurious, this had a confirmatory ion and you knew that this was a substance albeit you doubted whether it had got anything to do with what you had found in 2013, despite the very close similarity in weight?
A. I need to just clarify that thing on the confirmatory ion. In 2015 when I did it I thought I had seen a confirmatory ion at about 360, but we was asked some detailed questions and I looked at this ion again and looked at its accurate mass and molecular formula and it doesn't have -- the error is too far out to be the plus 1 isotope.
Q. So there is no confirmatory ion?
A. No, so this ion is getting down to the level of electronic noise, if you can go down far enough the machine just becomes a random number generator at least at very low levels because of electronic noise.

Q. That is new information and very helpful. Your other points were I think, first of all, rather like the housemaid who had to confess to an unexpected baby, it is very small, right, that is your first point?
The second point is it wasn't found in urine 2, which we now know is a sort of dilute mix of nitric acid so that doesn't really take us very much further.
The third point is that it elutes very much later than that which eluted in 2013?
A. Yes, I mean there is an extreme difference -- one is right --
Q. I fully appreciate that and we will come to the significance of that in a moment.
Those are the three points. You have added to that that further study, that I didn't know about, has indicated that there is no confirmatory --
A. I think that was amply mentioned in the statements.
Q. Whatever else we call it, I think spurious is not the right word, although it was the word adopted I think by Professor Simmonds perhaps in error.
Right, back then to the beginning of this and what you do. You were sent a jar of what was described as sorrel?
A. Yes.
Q. And some blood and some stomach contents and some from

the upper digestive tract, no urine?
A. No.
Q. Why were you sent a jar of sorrel, what were your instructions, what was the point, what were you setting out to do?
A. My instructions were to look for anything suspicious or poisonous compounds in these samples.
Q. Did anyone suggest to you that it might be useful to discover what Mr Perepilichnyy had had for lunch?
A. No, I think I was more or less doing this work blind. I think that is probably the way Professor Simmonds works, she just gives me so I don't have any pre-conceived ideas about what I am doing.
Q. I understand, and I understand the virtue of that. You didn't really know why you were looking at a jar of sorrel?
A. No.
Q. No.
But you did and I think you established to your own satisfaction and indeed that of Professor Simmonds that the jar marked "sorrel" probably did contain sorrel?
A. It is a bit like the (Inaudible) data, the compound that we found is in our archive analysis as sorrel, but it is a very common plant compound.
Q. I understand. It is quercetin, I think, is a kind of

tannin, isn't it?
A. A glycoside of quercetin --
Q. Tannin occurs in all kinds of vegetable but there is a particular type of tannin which is known to live in sorrel bottles. Correct?
A. Well this particular glycoside, yes, it is not the most common glycoside of quercetin, but it is high up the ranks of being a very common glycoside of quercetin, that is why we could put an exact identification of it, because it is something we see a lot and we have worked out methods to identify it.
Q. It is not exclusive of sorrel, but it has a characteristic of sorrel, fair?
A. Yes.
Q. I think it is right, I am going to call it a marker, I know it is not a marker, that is to overstate it but an indicator, you didn't find that marker in the stomach?
A. No, as I said this, is a glycoside so the sugar bonds will be very liable to acid hydrolysis. I would imagine once it hits the stomach it gets hydrolysed.
Q. There is a limit to the amount of information we can talk, I am not so interested in why but in the fact you didn't find any in the stomach?
A. No.

Q. You didn't find any in the first part of the digestive tract?
THE CORONER: Are you saying that you are not surprised you didn't find --
A. I am not surprised I didn't find.
THE CORONER: Let me just understand.
Why are you not surprised?
A. Because it is a glycoside and the way the sugars attach to the quercetin, that bond is very susceptible to acid hydrolysis, being broken by acid, and your stomach is acidic.
MR MOXON BROWNE: If it breaks down in the stomach, you have also very little chance of finding it in the upper digestive tract by then?
A. Yes.
Q. If you are not surprised you didn't find it in the stomach nor it follows were you surprised you didn't find it anywhere?
A. No, I am not surprised.
Q. My understanding is now Kew are carrying out different kinds of tests or are organising different kinds of tests, is that right? Do you know anything about?
A. Yes, I believe Professor Simmonds has been asked to organise DNA testing, but that is different from what I do.

Q. I understand that. Do you know anything about the progress or whether it is going?
A. No.
Q. We may or may not find out in due course. The fact is that as far as you are concerned, today you are no further forward as to what Mr Perepilichnyy had for lunch?
A. No.
Q. The system that you employ, that is first of all extracting things by gas chromatography and then identifying them using mass spectrometry is capable of picking up pretty minute traces?
A. If you know what you are looking for, if you target it to look for a minute trace, yes.
Q. You found a trace which you identified as 360.1965, in fact I think you carried it to six places of decimals but for short 1965. Is that right?
A. Yes.
Q. You did what you are supposed to do, which is to apply that to a database and you discovered a formula which I think is H20C26N2 --
A. I have it written down C20H26N204, as a molecule.
Q. As a molecule. I know later you formed the view that maybe that was two toffees stuck together --
A. Two toffees stuck together yes.

Q. -- but for the moment let's think of it as a single toffee. You said what is -- first of all of course there could be a number of different chemicals that add up to that, but you decided that that formula was the appropriate one for mathematical and technical reasons that we don't go into, but you took into account that it could be a variety of things and came to a pretty certain view that you had the right one?
A. Yes, it looked pretty confident as a formula, providing we accept we are looking at an organic compound. If you start throwing unusual elements in there --
Q. Your next step is to go off to the dictionary of natural compounds, which is not a leather-bound dictionary but a computer database, correct?
A. Yes.
Q. From that you found that from the entire natural world, from the bottom of the ocean to the top of Everest and in people's stomachs and wherever you like to look, there are in fact only five substances which have that formula in nature?
A. Some clarification?
Q. Yes.
A. These are natural products, these compounds have been isolated from plants, mainly plants, fungi and marine organisms. It will not take into account compounds

commonly found in a human digestive tract.

For example I was stumped for about half a day by major peak in one of our samples, no matches in the dictionary of natural products. Finally I convinced myself this was cholic acid from bile, so cholic acid from bile is not listed on the dictionary of natural products.

Q. For years past I have been under the misapprehension, I think as a result of something that Professor Simmonds had said that if it is found, it has been ingested but that is not the case, it can be produced by the body?

A. Obviously the bile secreting can be causing --

Q. I thought they would turn up in the dictionary, but they don't?

A. No they don't. Certainly that one doesn't.

Q. That one doesn't. Okay. What we do know is that it is a natural product which is not of that nature, it is unique to the gelsemium plant, there are I think five and they are all -- they all are found in gelsemium plants?

A. Well I come back to the point that it could be a digestion product of protein, because that would contain carbon, hydrogen, oxygen and nitrogen.

Q. I think you made that point and I have understood it.

A. But as an intact molecule in the plant kingdom --

Q. It points --

THE CORONER: Do let him finish, I am sorry, it is difficult stuff and it is made much harder if I don't get the whole answer.

You just finish.

MR MOXON BROWNE: I am sorry, sir.

A. As an intact molecule in the plant, fungal marine organism kingdom, I think at the time that the first report was produced only known from gelsemium, but the dictionary products have added another source of is it scopolium? Another compound of that formula has been discovered in other plant.

Q. One more, I think.

A. One more, that has been added since the first report, in the last four years or something.

Q. It begins with a M, I think. I have forgotten it but there certainly is one.

That perhaps introduces the point, people say is the dictionary complete or is it up to date and of course one doesn't know exactly, but it is continuously updated?

A. It is probably not up to date, it probably takes a year or two for things to come into it.

Q. In all events, Professor Simmonds, if not yourself was satisfied that the match with gelsemium was something

that was worth looking into?

A. Well, don't forget I was looking for gelsemicine from my list of compounds and it matched with this, so I got the match which I felt needed to look at further. I went ahead on my own discretion to get --

Q. You did it rather than her, that is helpful.

What the dictionary was showing you was that one of the compounds was I call it gelsemicine but you know what I am talking about?

A. Yes, I don't know quite how --

Q. Then there were I think four isomers, which are exactly the same weight but different structures related chemicals. These are essentially biogenetic mutations that have occurred over millennia, so very, very closely related but they are not gelsemicine, they are different things and they have varying degrees of toxicity approach.

It is the fact I think, you know, and I am sure Professor Simmonds will confirm, that of the two major gelsemium species, that is elegans and sempervirens, that gelsemicine is found in both but the isomers, the other four, are only found in elegans, or so the literature indicates. You are nodding?

A. You cannot take the literature as the absolute proof I have discovered that over the years. You need to do

it yourself.

Q. Yes. Well I think that Professor Simmonds is the person probably whose opinion we should take on that, but that is what the literature indicates.

What you did or what Professor Simmonds did was to look in your herbarium and find a gelsemium sempervirens plant?

A. And elegans as well.

Q. Later, but I am trying to do this going through what happened?

A. The first analysis I went and got.

Q. You went and got?

A. Just the gelsemium, because that was reported because it was targeted for gelsemicine, that was the thing that made the match. I did actually notice there were other ones, but I still pursued gelsemium and that is why I picked gelsemium sempervirens.

Q. You were confining --

THE CORONER: It is just it is difficult stuff to transcribe.

MR MOXON BROWNE: I understand.

What were we talking about --

A. Species of gelsemium.

Q. That's right, yes.

Not only did you confine your comparative testing to

one species but in a sense it was the wrong one, because although gelsemicine is found in both, you haven't got, according to the literature, any prospect of identifying any of the other four?

A. I wouldn't say any prospect. The those isomers could have occurred in sempervirens just not in the literature.

Q. It is not criticism, this is very difficult territory but with hindsight you got the wrong one?

A. Well no because literature said that gelsemicine had been isolated from gelsemium sempervirens and there was a major alkaloid in that and at the time I was trying to show that peak either was or was not gelsemicine --

Q. Yes, but you were not interested in what else it might be?

A. I believe that is why we was asked to look at the range of gelsemicine species to try and look into this possibility.

Q. That was later, yes.

Not only did you confine your search, but you also confined it to the root you didn't look at leaves or the stalk or the seeds?

A. That was the source material that was published.

THE CORONER: Sorry.

A. That was the source material that was published, it was

isolated from the roots of gelsemium sempervirens.

Q. I think it is the case, I believe Professor Simmonds will tell us, that it is known that gelsemicine is found in the roots so it is quite a sensible thing to do if you were confining your attention to gelsemium. But of course you were depriving yourself of the opportunity of what might be in the leaves, the stalks or the seeds?

A. That is true.

Q. If we take an example which I know the coroner will be very familiar with of cannabis, which has been extensively studied. I think you know that different parts of the plant have cannabinoids which can have very different effects?

A. Yes.

Q. Indeed the height at which the plant is grown, whether it is grown at Kew or halfway up some Nepalese mountain or whatever, makes a big difference?

A. Yes.

Q. What you were doing was making a comparison between what was found in the stomach and what was found in a particular part of a particular plant that you happened to have of the species gelsemium sempervirens?

A. Yes.

Q. You found that you could extract something, which will call "presumed gelsemicine", from that plant which is

eluting around about the 8 minute/9 minute mark, different from the 6.9 minutes which was characteristic of the stomach contents and the fracture pattern was different.

You concluded from that what was in the stomach was not gelsemicine, or at least was not the same as what you had extracted from the root?

A. I believe I concluded that it wasn't gelsemicine.

Q. I think it was Professor Simmonds's conclusion, she expressed it extremely carefully. I think she was under a certain amount of pressure, maybe, to produce different answers but what she said was --

MS BARTON: Sir, that is outrageous, there is absolutely no basis for that submission or that question at all in fact.

MR MOXON BROWNE: Well, we can deal with that tomorrow. There is in fact correspondence between those closest --

THE CORONER: It bedevils a bit, because everybody does it every so often and it causes such trouble. I try and ignore it, but it is the comments in the thing. You do to it sometimes, others do, you are not alone but I would really be helped if you --

MR MOXON BROWNE: I appreciate that.

THE CORONER: It just causes heat rather than light. I know you cannot help it, but if you could stop it I would be

ever so grateful.

MR MOXON BROWNE: We do need to concentrate on what it was she was saying. What she was saying was, "I can tell you that what was found in the stomach is not the same as what I got out of the root". That is all she said.

Do you accept that?

A. Yes, it wasn't gelsemine -- gelsemicine.

Q. Well, yes, that was assuming that what she got out of the root was gelsemicine.

There were in fact two major peaks that she got, there were also two minor ones?

A. Yes.

Q. You paid more attention to the major peaks and you gave different elution times to each, you didn't bother so much with the minor ones, you didn't give them elution times, but they were quite close together you have got four peaks. You are only supposed to have one peak aren't you, because the literature and the dictionary tells us that in gelsemium sempervirens there is only one relevant chemical, compound, which is gelsemicine. Yet you are getting four peaks, what is that telling you?

A. It is of no surprise, which is sometimes why we have a problem using plant material as standard. If you use a plant material as a standard which causes both

compound X and you get one nice peak, you are happy. More often than not, if you use plant material to get standard compound X and you look at compounds with that molecular weight, you will get more than one peak. Then you are a little bit stumped, because you don't know which peak is compound X or any of them.

Q. The fact is to this day you don't know which of those peaks is gelsemicine?

A. No.

Q. We talk about "presumed gelsemicine" lying somewhere in those four peaks?

A. Yes.

Q. It is perfectly possible and indeed probable that the three peaks represent very, very close biogenetic mutations which are not in the dictionary, because there are endless --

A. It is also possible, as I was mentioning just now, that they could be chromatographic artefacts, it is just my experience looking at them it looks like a compound chromatography -- it is changing between equilibrium forms, between a little peak and a big peak.

Q. We must very carefully to your experience, your expertise and your gut feeling, because that is why you are here.

Is your feeling that these do represent four

unidentified compounds which are different from one another or is your feeling that it is to do with an artefact of the process?

A. I would err on the side of saying there are two, but I would not exclude the possibility that those four peaks just represent one, but I would err on the side of there being two.

Q. You say two, that is your gut feeling, that means one of those is gelsemicine and the other one is something that --

A. Something else.

Q. That Kew have discovered?

A. Yes.

Q. We will call it "kewsemicine", a new one. That is where you were. You produced a report. I think that the representatives from Surrey Police were then in correspondence because of this mention of gelsemium and there was an interview with, I don't know whether yourself but certainly with Professor Simmonds and the whole thing was gone into and there was discussion about how she might word the matter and so on.

That resulted in a report, in which she stuck very carefully to what she had originally said -- you are nodding, that's right, isn't it?

A. No, from my point of view I did this analysis and

submitted my first analysis in my report to Professor Simmonds and then I had no further involvement in this case --

Q. No --

A. -- until I was asked to look at other samples of this. I don't know what happened, I was unaware.

Q. That is all June, July and I think August was when she produced the final clarification --

A. Yes.

Q. -- of 2013. Insurers arrive on the scene, my clients in the spring of 2014, and look at all the material, and provide some questions to the coroner to ask Professor Simmonds and those landed on the Kew plate. I think in some time in 2014, do you remember that?

A. As I say, my next involvement was to look at the gelsemium sample --

Q. For continuity I want to fill in what happened.

A. I don't know what happened between --

Q. No, for the coroner's assistance. There was to be an inquest in May 2015, but as a result of the questions that have been raised, I stress questions, that have been raised and actually against the wishes of insurers, the case was adjourned so that further tests could be done.

That was on the basis of answers given to

Professor Simmonds about what she had done and what she thought it might be useful to do. That included a lot of information that was reported by the press, very widely publicised. Information coming from Professor Simmonds, you are nodding, you know about this?

A. I know Professor Simmonds came into my office and said there has been reports in the press but there is some errors in it. I actually didn't know what she was talking about, what is this about?

Q. Just to get --

A. To be honest, we was in a very -- we were in a middle of a restructure at work and I didn't even bother to look at the press reports.

Q. That's very sensible. I don't imagine the coroner does either, he will be sympathetic.

So the summer went by and I think that everyone was waiting to see what you had to say about the suggestion that it might be more profitable to look at elegans rather than sempervirens. It reached the point where I think Professor Simmonds actually had to come along and explain to the coroner what the delay was about. This was calibration difficulties, essentially?

A. No, that was a bad year for the machine. We had one instrument failure after another. It was a very awkward

year. For example we had the hard drive of the computer that controls the instruments failed, that was replaced by a new computer which hard drive failed again, surprisingly one month later. Then we had a circuit board blow in the accurate mass part of the machine, then we had a circuit board blow in the --

Q. You had problems?

A. We had a lot of problems and you must bear in mind that Kew is not a wealthy institution, we cannot afford first class services.

Q. Nobody --

A. We had to wait a long while for an engineer to arrive --

Q. I had sensed that there were calibration problems and I think you are --

THE CORONER: No, I think he is saying it was not calibration, the machine hard drive has gone and then your circuit board.

That is it, isn't it, that is it?

MR MOXON BROWNE: I was not listening.

THE CORONER: You were not listening.

MR MOXON BROWNE: Before we leave the earlier work, I think you the suspect, we call it the suspect, the unidentified sample 359.1965 was subjected to collision energy to observe its fracture characteristics, and it produced a major fragment at 180?

by this time if I recollect had some urine, which you hadn't had before?

A. Yes.

Q. You had quite a lot to look at.

These were subjected to the same kind of tests as you have carried out in 2013?

A. Yes, I did.

Q. And you got results that you have told us about. But a remarkable observation was that whereas in 2013 your presumed gelsemicine, the four peaks, were eluting round about 8/9 minutes, your presumed gelsemicine from the new test, that is to say with the exact right weight, were eluting around about 11, 12 minutes?

A. That comes back to my point that these alkaloids, like other alkaloids, are difficult compounds. I mean the compound we use as a control to just check that the chromatography is basically working is a "well behaved compound".

Q. Yes.

A. I have looked at data over the last three-year period, that retention times varies by less than a minute, that --

Q. In this case?

A. These alkaloids are going be very susceptible to slight changes in pH, any liquid that goes through the column,

A. Yes.

Q. We can liken that to a bar of chocolate, Cadbury's chocolate in squares and a Kit-Kat in lengths. They may have exactly the same weight and so you say maybe they are the same, they have exactly the same weight, hit them with a hammer, the Cadbury's will break into squares along the line of least resistance whereas the Kit-Kat will break into lengths. Then you will know the difference?

A. That is one way of looking at it, yes.

Q. We are going to have toffees in a moment, yes.

Then to take an analogy with the elution time, if you boil up your Cadbury's and your Kit-Kat they will obviously behave differently when they are heated. That is a very, very broad analogy with the elution rate, so they have to all match.

So we go forward now to just before Christmas 2015. By this time, after this very long pause, you have acquired some elegans plants from abroad somewhere.

A. The samples were provided by Professor Simmonds. I see from the collection reference that some were from Kew collections, others I can't identify from the reference where it comes from.

Q. Anyway you got some and I think you also got a good clutch of fresh sempervirens plants. You also I think

we have to put a small amount of alkaloid -- sorry, small amount of acid. Measuring a small amount of acid you can have an error, and that slight error can have a big effect on how an alkaloid behaves because it can accept a charge or donate a charge. A charged version of a molecule will chromatograph differently to the non-charged version. So it is a -- I would call them an awkward compound.

Q. An awkward compound, yes, difficult to deal with.

I think the point is this, Mr Skelton was trying too elicit from you weight, fracture pattern, elution time trying to rank them in order of relevance. I would suggest to you that elution time really is way at the bottom, it can vary, it is not really very helpful?

A. Yes but -- yes, yes, yes.

Q. You agree?

A. There is a traditional in olden or if you are using like somebody's target analysis we have heard about, they may well rely more on elution time, because they are using -- using a UV detector for example, which is less information rich than a mass spectrometer, then the elution time becomes more important. When you have a mass spectrometry, the importance goes down.

Q. Yes.

I think the main thing to summarise that emerged

from that mass of detailed data, I don't think we need look at that but the main thing that emerged was that you were getting returns for presumed gelsemicine from around about 11, 12 minutes with the 359.1965 or thereabouts signature, and a fracture pattern which more or less matched the behaviour of the presumed gelsemicine that you had extracted in 2013?

A. Yes.

Q. You were saying and concluding two things, 1, well, this elution time is different from what we saw for the stomach contents in 2013. I have suggested that might not be the most reliable point to make.

You were also saying that the fracture pattern is different. I would like to suggest to you, just as a summary of the way you were presenting your position in reports, that we see a slight shift away from elution time and you were beginning to emphasise, for the first time perhaps, the importance of the fragmentation pattern. I am not saying it is wrong.

A. It may be because in our normal line of work we were often isolating compounds new to science, when you write your scientific paper you introduce the compound by saying, "We are looking at this peak at 10 minutes", so it is almost in your brain to mention retention time first --

Q. Yes.

A. -- you need to have a different brain for doing perhaps a forensic analysis.

Q. I think your experience in comparing, which is one of the questions have been fired at you and you are very thoroughly familiar with the arguments being put. I think you are really saying in this particular case perhaps retention times is not the biggest help?

A. No, certainly not for these alkaloids.

THE CORONER: Sorry, I missed that.

A. Not for these alkaloids. I can easily move them around by changing the pH of the liquid that goes through the column.

MR MOXON BROWNE: Then I think you did a third set of tests, and I think I am right in saying -- I think it is fair to say that two things emerge from this series number 3.

One was that in a fresh series of tests, looking again at the stomach contents, you found 359.1965, it haven't got away, it was not imaginary, it was there looking at you saying, "What am I?" Wasn't it?

A. Yes.

Q. You still didn't know?

A. No.

Q. What you did think on this occasion is that perhaps it wasn't really 359.1965 at all but two halves stuck

together?

A. Yes, because the questions that had come up required me to look at this ion in much more detail than I had done previously.

Q. Yes. Well I think I may have borne some small responsibility for teasing you in that way?

A. And we had the change from the scanning from 250 upwards, we were then able to scan further downwards so suddenly something emerged in front of your eyes which was not there before.

Q. Let's look at cluster, because it is now a very important part I think of what you are saying.

Can we think about toffees. You get the gas chromatography --

A. Liquid.

Q. Liquid chromatography process. At a certain point, let's say at 9 minutes, you are bubbling up a lot of identical toffees with let's say M/Z 180. In that condition, with a population of those toffees, you can get a situation where two of the toffees stick together and you have double that, correct?

A. Yes.

Q. More or less. Just to try to understand this very technical stuff. It is a precondition for that to happen that you have the population of single toffees

bubbling up at the same time, ie co-eluting?

A. Yes.

Q. You are saying, for a variety of technical reasons that I have nothing but respect for, that you think that that is what we have here?

A. Yes.

Q. I simply want to invite you to consider two things.

One I think in your report, that you expressed that conclusion as a matter of probability, rather than a matter of certainty. I would suggest to you that that is a properly cautious and responsible position to take.

Professor Cowan, who is the independent expert who the -- you are independent, but another expert who has been appointed by the coroner takes the view it is merely a possibility. I don't think the coroner can take it as a given that your cluster theory is correct. I will obviously be asking questions of Professor Cowan about that.

You probably have read his report?

A. Yes, I mean, yes it is a probability.

Q. It is a matter of probability?

A. You need to do -- I am not an expert on cluster ions, but I guess if you wanted to prove it beyond all reasonable doubt you would have to find out what this compound was and analyse it and see the cluster.

Another thing you could do is completely change the solvent system and if they are still together, well you haven't proved it entirely but you might expect if they were two compounds they would move apart, but we haven't done that experiment.

Q. Let's keep it general in terms of broad propositions that we can all understand. You have 359.1965 found in the stomach, subjected to collision energy in 2013, produces a major fragment at 180 plus several decimal places. You didn't actually measure the exact molecular weight in 2013, but you were kind enough --

A. No, because in 2013 the MS/MS spectra will not have been recorded in high resolution. They were not being recorded at high resolution.

Q. You were kind enough to carry out that exercise recently, the pesky insurers making you do more work. We obtained an answer which is extremely close to the major fragment that was produced from the unidentified ion in 2013, extremely close.

A. Well it was a 180, in 2013 it was a nominal mass and this was an accurate mass.

Q. Can you explain that the coroner?

A. In 2013 the 180 was acquired by low resolution, so you could only go to say 180. When you do it at high resolution you have got 180. whatever it was, 01 -- I

they don't explain, but it was amongst the population they studied.

A. I expect it was in someone's garden.

Q. In someone's garden, yes. Yes.

They extracted a compound called gelsempervine, two different types, I think we need not bother with that. You are correctly pointing out that that is a different compound from gelsemicine, it has a marginally different formula. I think it is just a couple of hydrogen atoms, but it is obviously very much in the same family.

The point I wanted to make was that when subjected to collision energy it too is producing a major fragment at 180, my tired old eyes?

A. I think it says "1011", does it?

Q. Anyway, it is 180 and several decimal places which is almost exactly the same as our major fragment -- when I say almost exactly, to within parts per million, almost exactly matches the fragment that we got off our friend 359.1965. I just want to suggest to you that this demonstrates two things.

(1) that these compounds do have or can have a propensity to fracture in that way.

And that the three different figures, all so close together: the major fragment from you, what I call the Kew fragment in 2013; the Nardin fragment from 2016; and

think it was 0102.

Q. What I am suggesting, and I may be wrong and if I am I want you to say so. What I am suggesting is that the major fragment that was produced in 2013 bears remarkable similarity to what I would describe as the single toffee, and it is exactly half the 359.1965?

A. It cannot be exactly half, because you have to take off one half it and add on one, so it cannot be exactly half.

Q. Can I put it this way, they appear to be associated?

A. I am sorry mass spectrometrists are very exact about numbers, so almost the right weight is not good enough.

THE CORONER: It will not do. No.

MR MOXON BROWNE: Yes, although I think you do allow 5 parts per million.

A. Yes, 5 parts per million.

Q. With that in mind, if we turn to Nardin and then I will sit down I think very soon.

Nardin, we find in core 2, 715, I want to take you to 721.

Quite coincidentally while all this was bubbling along some Italian scientists at the University of Turin were looking at the fracture characteristics of various herbs that they say they had gathered in Alpine meadows. What gelsemium elegans was doing in an Alpine meadow

your single toffee, if I can call it that, that you extract in 2016. All so close together indicates, no more than that, indicates that we are looking at something which is associated?

A. Well, I mean from my data the two M/Z 180s, they have to have the same -- if my proposition is correct, they have to have the same molecular formula. If the molecular formula is the same as the fragment in the gelsempervine, but this coincidence is not such a coincidence as you might imagine. If you look at the dictionary of natural products and look at known compounds between a mass of 179 and 180, they are 226 of them there are 226 of them, but they only occupy 12 formulae and of those formulae, 89 of them occupy the formula as these fragments. So the coincidence is skewed by what formulae the chemical operate in, and I am afraid I am not sufficient of a mathematician to say is this a coincidence or not or is the coincidence been increased by this thing.

Q. No.

A. So it is not a complete distribution of masses.

Q. No, I see that.

A. The masses have to be in certain --

Q. I think I follow. I am certainly not in a position to challenge anything that you say.

What you can state with complete certainty, as Mr Skelton elicited, is that the compound 359.1965, if it is a true compound, a single toffee rather than two smaller toffees, is not the same as anything that you have yet found in a gelsemium plant?

A. Yes, I can say that with certainty, yes.

Q. And I readily agree with that proposition, which has been evident all along. What you cannot say is whether in substance, which I would suggest seems to have strong associations with gelsemium, isn't from a different part of the plant, or from a compound which hasn't found its way into the dictionary of natural products or is simply below the limits of your detection, these are all live, realistic possibilities, are they not?

A. You cannot allow with certainty, so you are into the levels of probability again.

Q. Probability?

A. Yes.

Q. Yes.

That brings me to the final point. My clients were saying -- this is relevant because we were saying it in effect through the coroner to the people at Kew, you are never going to be able to resolve this with certainty, it would be far more profitable to look at the alternatives, to ask yourself, if it is not gelsemium,

what is it. As you know there are lists that you can obtain of different chemicals and you can look at them and say, "Well this chemical is only found on the bottom of oceangoing liners" or somewhere that you wouldn't have as part of your breakfast, we can discard that and have a look at that, it is not something you ever did, was it?

A. Yes, I did look at the M/Z 180 option and looked at this Human Metabolome Database, there were a number -- I have forgotten how many hits there were.

THE CORONER: Do finish, just say that again.

A. There is a Human Metabolome Database.

THE CORONER: Yes, and?

A. There were a number of compounds with this formula on it. I can't remember exactly how many.

MR MOXON BROWNE: I will tell you, there are exactly 11 and of those Surrey Police, which I think is obviously the product of Ms Barton's midnight oil, suggested that two were commonly found in food, one maltoxaxine and one salsolinol or some such which is found in chocolate, you remember seeing that, that is part of what was put to you.

THE CORONER: Do you agree with that? Do you know about that?

A. I saw those compounds on the list of 12.

THE CORONER: You said 12, do you.

A. 11.

THE CORONER: Anyway chocolate?

MR MOXON BROWNE: Chocolate and cereal.

A. I didn't go down, I just looked at the list of compounds and the structures.

MR MOXON BROWNE: There are others who can deal with this but I just wanted to -- are you familiar with the Human Metabolome Database?

A. I have only encroached on it since doing this Inquiry, because we obviously don't search plant compounds against the Human Metabolome Database, it is something I have come across.

MR MOXON BROWNE: I just want to sew the seed and, as Ms Hill would say, put down a marker. If you look at the Human Metabolome Database, not only does it give you lots and lots of information about the chemicals, it also gives you, as you would expect, the MS/MS spectra. So instead of asserting "It could be maltoxaxine", it is very easy to find out whether it is or not, because you have provided us with the relevant spectra and the database.

Do you agree that that is a very, very straightforward exercise?

A. Personally I haven't seen the MS/MS spectra on the Human

Metabolome Database, but again I'm not an expert on it, because I have not had to use it up to now.

MR MOXON BROWNE: That will be one for Professor Ferner. Thank you, sir. I'm sorry I have gone over time.

THE CORONER: Not at all.

MR STRAW: Thank you.

Questions from MR STRAW

MR STRAW: Dr Kite, we have heard that Dr Branch removed some fragments from the stomach and intestine samples before passing the remaining samples on to you.

A. Yes.

Q. Were there any obvious samples of plant material in the items that you received?

A. No, I mean we were asked that question and we opened the sample bags to have a look. I just did a visual look. I think Professor Simmonds took some away to look under the microscope and I believe she said she could not see any obvious fragments, but I just looked at them with my own eyes when we opened the sample bags.

Q. The samples I think were first -- that is AWF 32 to 37, stomach, the intestine, blood, were first tested on 10 May 2013 --

A. That's correct.

Q. -- is that correct?

At that stage, did you form the view that the blood

was presumably haemolysed?
A. I am not an expert in analysing blood. That was my presumption of the way it looked. It looked black. I found it a difficult matrix to handle. We are obviously not a -- obviously a botanic garden is not a lab which is expert in analysing human blood. I did the best I could with those samples.
Q. Did you come to that assumption I think you say in your report because it failed to clarify upon centrifugation --
A. From my general knowledge I assume you can spin down red blood cells, but I couldn't.
Q. You are not able, are you, to help us as to whether toxins in blood may have degraded or disappeared in storage before they reached you?
A. I am not able to help on that point. I just note that my analysis blood samples were rather lacking in detecting much at all.
THE CORONER: I don't think this is going to be the expert for that, is it?
MR STRAW: Is Professor Simmonds right to say the work undertaken by you was not an exhaustive analysis of all potential toxins?
A. Yes, I mean it is impossible to do an exhaustive analysis, because where do you end? In my first one we

took a list of the 120 or so deemed to be very toxic compounds, then you are into the slightly lower toxicity compounds, we have more of a list, still not got anywhere but within the compounds whose toxicity presumably you have got to eat a lot of them and then they should become pretty obvious in the analyses.
THE CORONER: The lower the toxicity the more you would have to consume of it?
A. Yes, yes. I have feeling that they would become pretty obvious, I mean my experience -- I have never been asked for that many stomach contents. The most would generally be from livestock, and when they have eaten a poisonous plant it is pretty obvious from the stomach contents.
Q. The method of analysis that you used, would that pick up all toxins from plants or fungi?
A. No, and specifically we have no expertise in protein analysis, so the toxic proteins and peptides are outside of our expertise. The process may well have detected them but we don't have the expertise or the software to analyse the data for small proteins and peptides like ricin or heparin.
Q. I think you were not testing whether there were any man-made compounds within this?
A. No, it is completely outside of that.

Q. Is it right to say that you don't yet know all of the alkaloids that occur in the species of gelsemium?
A. I doubt if anyone knows.
Q. The unidentified compounds from the stomach with mass 359 and so on, did you conclude it is likely that Mr Perepilichnyy ingested a substance that contained that?
A. My proposition was the mass is 179 and you can come to no conclusion whether he ingested it or not. You need to be an expert on what the human stomach secretes into the stomach, and I can't comment on that.
Q. It may be that I am taking that comment from Professor Simmonds's report, so I will revert to her with that question.
Were you able to say whether that compound came from sorrel, mericarps, caraway or potato?
A. I am not able to say, no.
Q. Just to be clear on this point, you are not able to say whether or not it was toxic?
A. Certainly, I am not able to say that, yes.
Q. Same final question with the intestine. I think is it right that an ion with the same mass, 359.1965, a very very low level was found in two of the intestine samples?
A. Yes, but I also looked for the 180, now I am my opinion

is the 395 is a cluster ion, so we would look at the 180 and that was in all the samples.
THE CORONER: That was in?
A. All of the samples, all of the gut samples.
359 is at a much lower level, so if it goes down it could just drop below the level of detection whereas the 180 is as high level, so therefore it is not going to drop down so readily.
MR STRAW: Are you able to say whether or not that was toxic?
A. No.
Q. Similarly the unidentified ion, the unidentified compound in urine, are you able to say whether or not that was toxic?
A. I think I said previously the indication was the levels were so low you would have to be extremely powerfully toxic to have any effect, if it were toxic.
Q. It was low, but I think it represents a real compound?
A. I am not so sure now, because I mentioned previously the confirmatory C13 isotope is not at the correct accurate mass in detail, that could be electronic noise giving the impression it was a confirmatory ion. So without a confirmatory ion or any knowledge of what this compound is, we don't even know what the rough mass is.
Q. You were asked about sorrel and quercetin glycoside,

which is found in sorrel. You noted that quercetin glycoside breaks down when it is ingested.

A. My presumption is that it would do, due to the acid conditions in the stomach.

Q. Does it break down to quercetin?

A. Yes.

Q. Was any quercetin found in the stomach?

A. It was found somewhere --

THE CORONER: It was found?

A. Yes.

MR MOXON BROWNE: The evidence we have already had is that it was found at the very bottom of the ileum.

A. Right, yes, thank you.

THE CORONER: Thank you very much. Yes.

MR STRAW: Does this jog your memory, from the report, that it was found at trace levels at AWF 35, but not in any of the other samples AWF 32, 33, 34, 36, 37 or 39.

A. If that is in the report, that is correct, yes.

Q. The reference for that is tab 69, page 586.

If that break down product quercetin was not found in most of the samples, most of the areas of the body that you tested, does that tell us anything?

A. I think even when it was detected, levels was very, very low so if in the other samples just dropped below the level of detection. So on the face of it, it looks like

what was eaten has progressed to part of intestine but if we are dealing with very low levels, which are getting near the limit of detection in the machine, so if the level drops down in some of the other samples we are going to say the level is not detectable.

THE CORONER: It could be, but at a below detectable level?

A. Yes, it could be. Yes, sir.

The implication is that that is where the food has got to in the digestive system.

MR STRAW: I think you said --

A. Not necessarily -- I mean quercetin is again occurs on the Human Metabolome Database, because virtually every plant you eat is going to contain quercetin. Probably if I analysed your stomach contents I will find quercetin, so it could be from a previous meal.

Q. That trace in AWF 35 could be from something else?

A. It proves that they have eaten a plant, probably.

Q. It is more the absence that I am interested in. Does the absence tell us either that he didn't eat any sorrel or the tests were unable to detect sorrel that he ate?

A. The tests were unable to detect the quercetin compound.

THE CORONER: There is a third option, isn't it, namely that it is there but below the detectable level. I don't think it is just those two options, I think that is what you are saying.

MR STRAW: Thank you.

The last area of questioning is going back to these three hurdles, in your testing, so taking your test whole, the 2013 and 2015 test, taking them as a whole.

The first hurdle, whether the masses are the same of the item in the stomach and then the gelsemium samples that you are testing. You have told us that there were five alkaloids of gelsemium which matched the mass of the unidentified compounds, do I have that right?

A. Presume that compound has a molecular weight of 358, which I am not agreeing with but yes there had been one added since then on the dictionary of products. So there are six now.

Q. There is six now and there were five at the time?

A. At the time there was five, yes.

Q. Right. Those masses matched, so you then go down to the next level and you look at your mass spectrometry?

A. Fragmentation patterns, yes.

Q. You I think took, is it 17 samples from gelsemium sempervirens and gelsemium elegans?

A. Some were subdivided because they were mixed samples of different organs, so they were separated.

Q. Nothing from gelsemium rankinii?

A. No, and as I say I don't know why. I am presuming no samples were available.

Q. Do you know for certain that all five of the alkaloids that matched at the time, all six that we now know match, were in those 17 samples from gelsemium?

A. I can't say I have actually looked for those alkaloids in those samples. We have four compounds producing ions at 359, so obviously there were less detected signals than we have compounds. So clearly some are missing.

Q. There were clearly some missing?

A. Yes.

Q. It is impossible then isn't it that the unidentified compound from the stomach matched one of the missing ones?

A. It is conceivable, but it is also conceivable that the published compounds did not occur in the plants but they may have changed during isolation and the literature is fraught with this problem of trying to isolate a compound which changes whilst you are trying to isolate it. It never actually occurs in the first place in the plant, so that is always a possibility you need to take into account, that the compound that has been recorded for a plant is actually an artefact.

MR STRAW: Thank you very much.

Questions from MR COHEN

MR COHEN: Can I first of all confirm the work you did was in May 2013?

A. Yes.
Q. The first work you did on this case?
A. I opened sample bags on 9 May and I had to put them back in again and the analysis was done on 10 May.
Q. I think if we look at the report, you say at the top of it that you finished it I think on 20 May. Is that correct?
A. Yes, because that time was used looking at the data, which was quite a time consuming business.
Q. To take another aspect of that report, it may be that everybody else is fully au fait with this, but just so I can make sure I understand, you refer to "M+H+", and you say assuming, this is in your first report, assuming this ion was M+H+ and you go on to draws conclusions. My understanding is that the "M" in that is molecule?
A. That's correct.
Q. And that the "H+" refers to a hydrogen ion and the point is that the way in which the molecule has been turned into an ion is by the addition of a hydrogen proton, so that you have charged it?
A. That's correct.
Q. When we refer to M+H+, we are referring to an ion composed of the original molecule and a hydrogen ion?
A. Yes.
Q. It is right, isn't it, that sometimes different

compounds respond differently to the process of ionisation?
A. Yes, some will preferentially take on an ammonium ion. I mean an alkaloid almost always takes on a proton because it is in the nature of an alkaloid.
Q. So if it takes on ammonium it becomes M+Am?
A. It becomes M+NH4+.
Q. NH4, and sometimes we have this phenomena where two ions cluster together, and that is where you have the shorthand 2M+H+?
A. Yes.
Q. And that is a feature of the ionisation process?
A. It is also -- I mean I am not an expert on molecular clustering but in fact it is my understanding this is a molecular cluster, because water should not be liquid at room temperature. The reason why it is a liquid is because the water molecules are clustering together by hydrogen bonding, reducing its boiling point, so it is a water. So we are looking at a cluster here.
And I just think that when, during the ionisation process, in a mass spectrometer the molecules are being forced together so they form a cluster.
Q. Indeed. I take the point. Sometimes it happens in nature, but it particularly can happen in the course of ionisation for mass spectrometry?

A. Yes, I think they are being forced in close juxtaposition so they -- as I say, I am not an expert on how cluster formation works.
Q. The next thing to understand is, if we look at your further answer, and it is the core expert bundle, volume 2, page 367. (Pause)
A. Yes, we are there.
Q. That contains a pasted version of some graphs that were in your original analytical work, is that correct?
A. I believe it does, yes.
Q. Specifically, for those who want to follow, it is figure 4 from the original report.
Focusing in on the bottom of those two graphs --
A. Which figure are we looking at?
THE CORONER: Page 367.
A. Yes.
THE CORONER: Have you got that? Figure 4 there?
A. Yes.
That is just a paste from the original report.
MR COHEN: Yes, that is the paste. Looking at the bottom of two the graphs -- again, I am just going to test my understanding -- the main graph with a time in minutes along the X axis, that is referring to the elution time of the substance in the liquid chromatography, is that correct?

A. Yes.
Q. Then the inset graph on the right with MS/MS, that reflects the compound, the ion, that has eluted at the time shown on the bottom graph being refragmented or being fragmented to see how it breaks up?
A. That's correct. I mean the insert on the left are all the ions on that spot, within a range of what the mass spectrometer is seeing, and the one on the right is the 359 isolated and fragmented.
Q. It has been put to you by my learned friend Mr Straw, and indeed by Mr Moxon Browne, there has been lots of reference to the ion at 359, but, so I understand, your view remains firmly that that is not an ion, it is two ions joined together?
A. No. It is an ion created from two molecules clustering together and being ionised.
Q. I see.
A. It has to be absolutely correct.
Q. Just so we are all completely clear on how it is you get to that conclusion, as I understand it the first thing you remark upon is, looking at that little inset graph, there is a peak at 180 and you make the observation -- and this is on page 367 -- that there are very few fragments above 180?
A. Actually that written one is the one that deceived me

because there are some small fragments above 180 but, looking at these detailed in this, I discovered that these fragments were coming from a compound of mass 360, which was being captured -- you isolate the ion in a window and the window is plus or minus two M/Z units, so if you have got two compounds eluting but they are separated by one M/Z unit, they will both be isolated and fragmented together. So those small ions, which originally deceived me into thinking that this was a molecule, they vanish when you look at it pure and there is no ion at all between the 180 and the 359.

Q. And the significance of them vanishing is that you have explained to the learned coroner that the way in which mass spectroscopy works is by breaking compounds of ions up so that you can look at the fragments, and if there is only one fragment, it indicates that the situation is --

A. If there is a weak bond in the molecule, you would expect the fragment created by the breaking of that bond to be the most abundant one in the spectrum. So here we just have an interaction between two molecules, not a bond, it is a hydrogen -- they call it a hydrogen bond but it is an electric attraction between two molecules which is a very weak interaction, so that just breaks preferentially.

Q. So the first tell when you were doing this work that made you think, "Actually, that ion is a cluster", was the lack of fragments above 180 but, as I understand it, the next point which has led to an increase in your level of confidence is contained on page 369, figure 4?

A. Yes, so what this shows, there are four graphs there, the top one -- these are extracted chromatograms at a very accurate mass. So the top one is 180.1016, which I am saying is the true M+H+; the one below is the 359 registered, the 2M+H+, and they exactly coelute. The one below that is the carbon 13 isotope, the +1 ion of that cluster; and the one below that is another compound, I presume, which is almost co-eluting with our compound. That is the one that created the mixed spectrum.

Q. Now, Dr Kite --

A. It is getting a bit complicated.

Q. -- you are an expert and this is quite complicated. So I am going to try and break this down a little bit, unless I am the only one in the room who perhaps struggles with this, in which case I am sure I will be told.

The point about chromatography is that it is a good way, as I understand it, of taking a mixture of substances and getting substances with like properties

in the same fractions, is that correct?

A. Not really. I mean the chromatography in these analyses is designed to just try and separate compounds.

Q. To separate them?

A. Yes.

Q. But the significance of the fact that you have in the first graph a compound at 180 and in the second one at 359 that have eluted at exactly the same time is that, as I understand it, your opinion is that they are the same substance?

A. Yes, the substance has eluted and then created the two ions. So therefore they must have the same retention time.

Q. They must have?

A. Must have.

Q. So, going back a step, the first signal to you that this was a cluster ion was the lack of fragments above 180, you have then done the chromatography and that makes you --

A. Well, possibly the first signal was when it started to scan below 250, I was suddenly seeing an ion of 180 in the first stage of mass spectrometry.

Q. Then you reached the conclusion --

A. So I was sort of then considering, why was I fooled? And I was fooled by these intermediate ions and then

I realised the reason why these intermediate ions were there: well, we had for compounds eluting, one of which was creating those intermediate ions.

Q. The point about the co-elution then is, as you said, they must be the same?

A. Well, because if the molecule is co-eluting, then creating into ions.

Q. Yes.

Turning up now 722, which is the Nardin article in volume 2 -- it is the same volume, it is just a bit further on. Tab 87, I think?

A. Yes.

Q. I think that is the table of compounds that Nardin and others, at 722, that they have isolated. Just so that I am certain that I understand, at the top of the second column along, it says "M+H+".

A. It is hard to read. Is this table --

THE CORONER: Page 722, top right, and, as you said, it is in divider 87. Have you got that?

A. "M+H+".

THE CORONER: Do you see where counsel is showing you?

A. Yes.

MR COHEN: So the point about this is that the values they quote are values based on this being the molecule with a proton.

A. Yes.
Q. And your view is that the compound that you found was actually 2M+H+?
A. Yes.
Q. So any similarity between the value in this column and values that you found is actually completely misleading?
A. It is misleading, yes.
Q. That, as I understand it, is one of the reasons you can say with the confidence that you outlined to my learned friend Mr Skelton that the compound that you isolated is not one of the ones that Nardin and others found?
A. Yes, because I have looked for this M/Z 180.1018 in all of the gelsemium samples and I cannot find it.
Q. And, for the avoidance of doubt, even if you were wrong in relation to this being a cluster ion, you still consider that the material, the substance that was found in Mr Perepilichnyy's stomach, is not one of the substances found by Nardin, found in gelsemium, or indeed found anywhere else?
A. Yes, because I was convinced of that before I realised I was not dealing with a cluster ion.
Q. Finally, Professor Simmonds remarks in her report that she was of the view that this -- this is page 229 for those who wish to turn it up -- that there were no other plant toxins isolated from Mr Perepilichnyy. Do you

agree with that conclusion?
A. We had never found anything that we could claim was a plant toxin.
Q. Of those known to the Royal Botanic Gardens at Kew?
A. Of those on that list, we had never found.
MR COHEN: You didn't find.
Thank you, Dr Kite. Those are my questions.
THE CORONER: Anything else?
MR SKELTON: Not for this witness, sir, no thank you.
THE CORONER: I think that is probably enough, isn't it?
MR SKELTON: It is, sir. It is as far as Dr Kite is concerned.
THE CORONER: All right, thank you very much indeed.
Thank you.
MR SKELTON: Sir, just a small point, Mr Moxon Browne mentioned that Dr Kite had not consulted data on MS/MS, which may have allowed him to identify the compound, but I wonder if, given that Professor Cowan is coming on Monday, if there is such data to be consulted, whether or not --
MR MOXON BROWNE: Sir, I didn't hear the first bit.
MR SKELTON: Professor Cowan is coming on Monday, and if there is data to be consulted which he ought to see before he gives his evidence, may I invite L&G to inform us as to what that data is so he could have a look at it

in advance.
Thank you.
MR MOXON BROWNE: Yes.
MR SKELTON: Thank you.
THE CORONER: Thank you very much.
So that is all -- and 10.00 all right tomorrow?
MR SKELTON: 10.00 tomorrow with Professor Ferner.
THE CORONER: I know you had something else but I think we will not go beyond 1.30, so you are good for that.
Thank you all very much. Thank you.
(5.40 pm)
(The Inquest adjourned until 10.00 am the following day)

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