

Evaluation of the Training of Chemical Weapons Verification project

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Final Report

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Executive Summary

This evaluation follows an extensive review of documents made available on training programmes run by VERIFIN between 2016 and 2018. In addition, the evaluator has attended 3 training courses at VERIFIN for a 2-day period on each course, to observe training. All course participants on each of these training programmes have been asked for views about the training they have received.

Over the interval 2016-2018 some 70 individuals participated on training programmes at VERIFIN and all were contacted to assess how they had made use of their training. Responses were received from about 20% of this cohort and their responses are referred to in the report and the detailed replies available in one of the appendices. All were complimentary about the training VERIFIN had provided.

The three training courses the evaluator observed cover very different topics and his remit was to assess the nature of the training rather than comment directly on content. Where applicable, as on the course on National Authorities, much of what was being imparted to trainees is known to the evaluator and so there are more recommendations for some changes in this section than others.

In total, the report makes 32 recommendations. These are largely related to ways in which some of the training might be altered to improve understanding. In some cases more interactive formats are recommended.

The overall assessment is that the training which VERIFIN provides is of the highest standard, incorporating excellent pedagogy, and highly appreciated by all who train with the organization.

Brief biography of Evaluator

Professor (Emeritus) of Environmental Toxicology Alastair Hay is based at the University of Leeds (UK). Now retired, Professor Hay continues to do research, teaching, and training of academics and others in more interactive forms of engagement.

Timetable

Attendance on training courses

Following consultation with the Quality Manager / Training Co-ordinator of VERIFIN it was agreed that the evaluator would attend courses at VERIFIN and to that end he attended for 2 full days each of 3 separate courses provided by VERIFIN namely:

- (i) 23 rd Training Course on National Authorities and Chemical Databases, 14-15 August 2019;
- (ii) CW-LSE course on NMR and Quantitative Mass Spectrometry, 18-19 September 2019;
- (iii) Laboratory Capacity Building Programme, 13-14 November 2019

It was also agreed that the evaluator would spend a few hours on the day following attendance on the courses (ie a 3rd day) for a debrief with the training co-ordinator and any other staff VERIFIN deemed appropriate and this was done.

The evaluator has been teaching and training for over 40 years and has run many training courses and some 'train the trainer' events. With a keen interest in active learning approaches the evaluator felt it necessary to observe training directly and this was agreed with VERIFIN. It was also agreed with VERIFIN that the evaluator may not always have the necessary technical expertise to comment directly on the content of what is delivered in training, rather the emphasis would be in how the training was given and where improvements might be made.

In each of the approximately 2 -hour debriefing sessions the evaluator provided detailed suggestions about possible changes / improvements to the various courses and notes were made by VERIFIN staff in attendance. On some occasions those delivering the courses were in attendance at these debriefs and were able to even embellish some of the suggestions made by the evaluator.

1.0 Background

Finland has been actively engaged in chemical weapons disarmament since 1973 with the Ministry of Foreign Affairs the main National Authority (NA) responsible for implementing the Chemical Weapons Convention (CWC) in the country. Signed in 1993 the CWC came into force in 1997. The CWC established an implementing body, the Organisation for the Prohibition of Chemical Weapons (OPCW) and NAs are the national focal point for effective liaison with the OPCW and other States Parties of the CWC .

In 1994, the Finnish Institute for Verification of the Chemical Weapons Convention (VERIFIN), became the required National Authority and it provides expert assistance to the Ministry of Foreign Affairs to enable compliance with, and implementation of, the provisions of the CWC in Finland. VERIFIN is an independent institute under the administration of the University of Helsinki. In 2010, due to institutional changes in the status of the university VERIFIN was incorporated into the Department of Chemistry but with no change to either its independence or function as a NA.

The organisational change has benefited VERIFIN leading to improved collaboration, multidisciplinary work and training through the chemistry department's Teacher Education Unit. Whereas the Department of Chemistry has research programmes primarily investigating material and natural resources, VERIFIN's research focus is on method development for identification and detection of chemical warfare agents (CWAs), and toxins of biological origin, in both environmental and biomedical matrices.

Article XI of the CWC encourages States Parties to cooperate and assist one another in areas which will improve implementation of the Convention. Finland has met this requirement by financing training courses which VERIFIN has organized. Funds are provided principally through the Ministry of Foreign Affairs' Official Development Assistance (ODA) programme , in part by the OPCW, and between 2015 -18 ,for a specific course on enhancing verification of CWAs , by the US Department of State. Aimed at experts and those working for NAs, many of the courses have been developed in conjunction with the OPCW's International Cooperation and Assistance Division.

1.2 The programme to be evaluated

Some 1492 individuals from 138 countries have been trained by VERIFIN between 1990 and 2018. Most trainees have participated in courses organized in Finland, but there has also been some in-country training in Ethiopia and Kenya between 2012 – 2018, and in the years 2018 – 2020 this will occur in Nepal and continue in Kenya.

Courses provided in Finland are the Laboratory Capacity Building programme (LCBP); National Authority and Chemical Databases (NACD) ; and Enhancement of Laboratory Skills in Analysing Chemicals Related to the Chemical Weapons Convention (CW-LSE).

The NACD training course provides those working for NAs guidance on establishing the NA, implementation of national legislation and declarations about chemicals and toxins manufactured, held, or traded by industry of other relevant organisations, like universities, for example.

Analysis of chemical weapons and quality assurance are the focus of the CW-LSE courses with the emphasis on intensive training on particular topics.

A laboratory capacity building programme aims to enhance analytical capacity and is arranged in close cooperation with specific laboratories to help meet their needs and requests with a mutually agreed training plan. This is the training which has taken place in Ethiopia and Kenya, and which will continue in Kenya and Nepal.

1.3 Previous evaluations

The first evaluation, conducted in 2001-2 was limited to the ODA funded portion of the training programme. Positive about what it observed the evaluation noted that there was added value in analytical skills development and increased capacity building for developing countries to enable them to comply with reporting obligations. The evaluation also recommended evaluation by Finnish embassies in the countries from which attendees had come and monitoring of the value of any training.

A second evaluation was conducted in 2010-11 with the most important recommendation being to move the emphasis from training individual chemists to a laboratory capacity building programme. This change took place in 2012 with two specific laboratories, one in Ethiopia, and the other in Kenya co-opted into the training programme. A second recommendation to broaden the scope of the skills training to go beyond CWA analysis to include other environmental analyses has also been implemented, the aim being to equip analysts with the skill to analyse any unknown sample or chemical.

2.0 Rationale, purpose and objectives of this evaluation

This evaluation will focus on development of training, future courses, sustainability of interventions, and the value of training to enable work to go beyond analyses of CWAs to other agents.

An assessment will be made of how training is delivered, how impact might be improved and how to assess value-added. Above all it is to enable VERIFIN to meet the objectives it has been set.

The evaluator has been set four specific objectives which are:

- a) An external view on how the 2011 evaluation results and recommendations have been addressed and taken into account, with reference to the possible need to improve the connection, collaboration, and coordination of the VERIFIN training with other relevant players;
- b) An expert assessment of the training modality, its administration and functions, and whether there are possibilities to improve and develop it further with the available resources;
- c) Advice on how the competences achieved by VERIFIN training could be utilised in the broadest possible manner by the participants in the developing countries;
- d) Views on the multiplier effect of the training modality.

3.0 Scope of the evaluation

The scope of the evaluation is noted and the issues to be addressed including meeting objectives, aiding effectiveness, sustainability, coherence, consultation with trainees in

development of programmes, methodology, relevance, impact, effectiveness and efficiency, timetable, quality assurance, reporting and mandate.

4.0 Methodology adopted in this evaluation (as set out in the Inception report) .

a) Desktop review of past 3- year training courses

The evaluator has requested documents relating to the last 3 years of training provided by VERIFIN including the assessments of training completed by the trainees. He has reviewed the documents and provided an assessment at relevant points in his report.

b) Contact with previous trainees

Contact details of the trainees who attended (See Appendix 1 ,page 34) over the last 3 years have been provided to the evaluator and he has written to all. Following discussion with the training co-ordinator it was agreed that there was no merit in duplicating what VERIFIN has already asked by way of questions in its own evaluations of training. Instead it was agreed that it would be helpful to find out how the trainees had benefitted from the training and whether they had been able to use all they had learned. In view of this trainees were asked the following questions:

- 1) How have you used what you learned on the course?
- 2) Have you been able to use all / most of what you learned? If not, why not?
- 3) What would help you, or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

(Some 70 trainees who attended between 2016 and 2018 have been contacted by email and asked if they would answer the questions above; responses have been received from between 15- 20 % of those contacted. The responses have been collated and lessons drawn from what former trainees write, see Appendix 2, page 35)

For the courses he observed directly, the evaluator has provided his own assessment of the training based on his expertise, but has also questioned directly, those attending the training courses to obtain their views.

How trainees were asked for their evaluations

Trainees were asked to rate the talks/lectures/demonstrations/practical sessions they attended. A 5-point Likert scale was used to evaluate individual sessions and data aggregated. In addition, there was a free form section of the evaluation where the trainees could comment in their own words on the training they had.

It was the intention of the evaluator to sit with each of the trainees towards the end of his visit to get responses and to note these. This one-to-one interaction is helpful for noting immediate responses and as individuals only need to talk (rather than write) more information may be gleaned. It was also the intention of the evaluator to find out what trainees plan to do with their training.

(The evaluator was able to interview some 11 of the 15 participants on the NACD course and collect responses. The other 4 trainees were contacted by email for their responses as the course finished early on the last day preventing direct contact with all. The assessment of the two OPCW presentations used a 4-point (ranging from excellent to poor) scale on this occasion and supplemented with a 3-point evaluation (essential, informative and not necessary) for the various lectures. Each participant also had views about delivery, content and interactive sessions and these have been noted and recorded).

(For an assessment of the 2nd week of the NACD course trainees were emailed an evaluation form and asked to rate presentations and interaction on a 5 -point scale and encouraged to provide additional comments on each section if they wished to do so. Although trainees were asked to provide a name it has been stressed that this is only to enable the evaluator to check where responses have come from and that all responses will be anonymized in the report he produces. An exception to this was responses from previous attendees on training programmes over the previous 3 years where they were asked for their name and institution).

Trainees on other courses assessed by the evaluator were spoken to during these events. As the evaluator attended one course on the penultimate day he was able to obtain all the information he required. In the case of the Laboratory Capacity Building Programme, the evaluator spoke to trainees on the 2nd and 3rd days of the course and emailed participants for their opinions when the course ended.

5.0 Delivery of Report

A final report in hard copy, with covering letter, will be sent by Courier before 31 December 2019 and in electronic form to VERIFIN by this date and after VERIFIN has had sight of, and commented on, draft version.

6.0 National Authorities and Chemical databases (NACD-course)

As VERIFIN noted in its report of the 22nd NACD training course (VER-VH-0408; 21.9.2018) the goal of the course is the give National Authorities (NA) or persons working closely in cooperation with the NA information on starting the NA, implementing national legislation and making declarations including data collection from the industry and other relevant enterprises. One of the important topics is the need to clarify what particular action is needed by the NA to enable the OPCW to conduct inspections. A final objective of the course is to enable trainees to use chemical databases to search for information which may be helpful for their declarations to the OPCW on chemicals.

The NACD course is financed by the Finnish Ministry of Foreign Affairs and trainees are identified following invitations to OPCW member states to select suitable candidates and submit applications. For funding reasons the course was shortened in 2015 to 8, instead of 10 days, and has retained this format since then.

The course is a mixture of lectures and practical exercises with most delivered by VERIFIN staff but approximately 3 days covered by OPCW personnel. The OPCW presentations cover background information about the Chemical Weapons Convention and implementing legislation plus lectures and practical exercises on electronic submissions. Up to 2018 these were on the Electronic Declaration Tool for National Authorities (EDNA) and the secure Information Exchange system (SIX). In 2019 training on EDNA was replaced by introduction to the new declaration tool being developed by OPCW namely the Electronic Declaration Platform (EDIS) .

Evaluator notes on changes to NACD course

The format for the NACD course is essentially unchanged over the period 2015-2019 as the aim is to equip trainees, most of whom either work for, or with, National Authorities about national implementing legislation on chemical weapons, declarations for chemicals and chemical plants and the collection of data necessary for these declarations, inspections carried out by the OPCW and discussions about corruption. All governments need implementing legislation, are required to submit data on activities relating to chemicals and are subject to audit by OPCW inspectors. These requirements have been in place since the establishment of the OPCW and the NACD course sets out to explain how to meet some of these requirements and hence there is little need to change the format.

The only significant changes are that in the final two days of the first week trainees were introduced to the new electronic data submission system EDIS in 2019, whereas in the courses from 2015 -2018 they learned about EDNA. A diplomat from the Finnish Ministry of Foreign Affairs has discussed corruption issues in a lecture since 2015 with the exception of 2016 when this was done by VERIFIN personnel.

Comments by trainees on previous NACD courses (based on review of records)

As with other VERIFIN training programmes feedback about the lectures and tutoring from 2015 to 2017 was extremely positive. Participants appreciated the hands-on practice they received using the EDNA tool. Most also appreciated training on searching chemical databases although a few in 2016 and 2017 who had more experience with a range of internet browsing tools questioned the necessity of this element of the course.

In 2016 several participants stated that they would have welcomed involvement of a OPCW legal expert to explain legislative matters regarding the CWC. This involvement, they suggested, would provide opportunities for a discussion between participants and the expert on a range of topics relevant to the participant's member state. In 2019 this happened with an OPCW legal expert giving lectures on several topics and providing some of the interaction previous participants on the course recommended.

Analysis of responses received by evaluator from previous participants on the NACD course

Although all those who attended the NACD course between 2016 and 2018 were contacted by the evaluator there were only 4 responses (See Appendix 2, page 43), but they are nevertheless helpful. It should be noted that two individuals had attended in 2018 and so some of their views may be duplicated slightly in responses obtained and assessed directly by VERIFIN and which will be commented on in the next section. However, do note that the comments received by the evaluator were obtained a year after the course was taken.

It is clear that all 4 respondents found the course helpful and improved their knowledge of the OPCW, the role of National Authorities (NA), and the use of chemical databases to collect information to facilitate data entry for annual returns which the NAs make about chemical manufacture or usage. What the trainees learned has also been passed on to others in their institution or in their NA.

For 3 of the 4 trainees what they learned appears to have created a good understanding of what is needed, and some are now involved in submitting data electronically to the OPCW. A difference in software packages has prevented one trainee from submitting data electronically as there appears to have been a difference in what she installed on her laptop whilst attending a VERIFIN course would not work on her return home; OPCW, which presumably provided the software, has apparently been made aware of the issue.

Resource issues appear to be a problem for some and place constraints on what trainees can do when they go home. For 3 of the 4 the course seems to have given them what they needed but for one individual it all appears to have been a little overwhelming and he feels the need to both attend further training courses and to work with NAs in other countries. This suggests that knowledge varies considerably between trainees on the courses and that some thought should be given on how to deal with the disparate backgrounds of participants.

That some follow-up training either by e-learning or webinars would be helpful is clearly something all would welcome. This would be an opportunity to clarify issues and enhance what had been learned on the course. It might also obviate the need for the same individuals to feel that they needed to attend other OPCW courses to acquire the information they need.

Immediate feedback responses by trainees attending the 2018 course – collected by VERIFIN

VERIFIN notes that the immediate feedback received by trainees was very complimentary both about the course content and the tuition provided. Expectations by the trainees were largely met.

Perusal of the individual feedback forms by the evaluator confirms this assessment. All the trainees liked the course, felt that their expectations were generally met and were particularly complimentary about the competence, friendliness and approachability of the tutors and their responsiveness to questions.

Two particular suggestions for improvements were noted by the trainees and VERIFIN has noted these too. These are for more time to be spent on the electronic databases and for more details about chemical weapons and their effects. Both these suggestions appear in feedback obtained by the evaluator on the 2019 course and are the subject of specific recommendations by him which appear later in this report.

Feedback responses from Trainees attending 2018 NACD course – obtained by VERIFIN 3 months after course finished

VERIFIN asked those attending the course how they had made use of what they had learned. Most reported that they had delivered some training or were planning to do so. The training varied considerably with most discussing the advantages of EDNA and SIX with one session only taking 30 minutes, but others were more detailed, like the 2- hour training given by one trainee to 9 colleagues. Some training covered the broader aspects of the course.

This feedback suggests that most trainees are passing on some (in a few cases, most) of what they learned and VERIFIN should be pleased about this.

Immediate Feedback about 1st week of 2019 NACD course obtained by evaluator

Most trainees rated the lectures on legal aspects of the CWC as either good or excellent and considered that the information was essential. They rated the case discussed as excellent and essential for understanding of the issues and they would like more cases but covering different legal issues. The case requires reference to the CWC articles and, as such, increases familiarity with the convention. Participants also expressed a wish to see a slightly different format for presentations to avoid having 3 lectures on complex issues one after the other. (For detailed responses see Appendix 3, page 48)

Just under half the trainees rated the introductory lecture on EDIS as satisfactory, or poor, with the exercises considered essential by the overwhelming majority. The general view was that the introduction was too fast and that trainees needed to be taken through the process step-by-step with the presenter demonstrating on a projected screen how and where to enter data. Trainees welcomed the opportunity to practice, but wanted more time for this, more cases and for the process from the introduction to be more interactive. (See Appendix 3, page 48)

Assessment by evaluator of Legal section of NACD course presented by OPCW

Three traditional lectures were delivered in the first of two appearances by OPCW staff. The 3 lectures, given by James Petit, a legal officer in the Implementation Support Branch of the International Cooperation and Assistance Division of the OPCW provided an overview of the Chemical Weapons Convention, legislative and administrative requirements for implementing the Convention and the current status of implementation.

The overview was necessarily broad in scope and covered the history of chemical weapons use, negotiations to secure the Convention, its requirements, the obligations of States Parties, the OPCW, key achievements to date and finally what the future role of the OPCW would be to prevent re-emergence of chemical weapons and where threats to this might arise.

Lecture 2 was a detailed look at Articles VI (Activities Not Prohibited) and VII (National Implementation Measures) of the CWC. The approaches to how countries might adopt implementing legislation, the initial measures to include in the law such as definitions of chemical weapons etc, the powers of the National Authority, prohibitions and penalties, and control regimes were all explained in some detail. There was much for trainees to absorb, but the lecture was setting the scene for a case which was discussed later in the day.

The third lecture was a brief, and up-to-date report on how many countries had effective legislation in place, where these were located and what the barriers to implementing were – these vary from one country to the next and might include resource issues, parliamentary time or country priorities.

What was clear from lectures 2 and 3 was the advantages for countries of having CWC legislation in place when pursuing individuals who may be involved in the illegal trade in chemicals. Without the CWC legislation, prosecutions may have to establish that certain chemicals were definitely used to make the chemical weapons used, a difficult enterprise,

whereas, under CWC legislation, mere trading of certain chemicals is sufficient for prosecution.

From an observer's perspective there was a good deal of information to take in (acknowledged by the presenter) and it was apparent that at the end of the morning that trainees were tired, struggled to find questions to ask as there was so much content, and could not identify specific issues to talk about.

The afternoon session could not have been more different. This was a very interactive discussion about a case involving a nerve agent precursor chemical exported from a non-signatory state to another non-signatory state, via a signatory state, and using a transport firm based in the signatory state. Trainees were divided into 4 groups to work on the case and identify what was legal, who was breaking the law and should/could be prosecuted. Participants had information about the legislation in place in the signatory state and had to use this, but also refer to the CWC Articles to answer the questions; the case was all about familiarising participants with Articles VI and VII. The case was excellent and it was obvious to any viewer how much the trainees enjoyed it. Feedback about the case (see Appendix 3) confirms this.

An hour and a half was allocated for discussion of the case, but it was clear that this could easily have been a 2-hour session. The feedback and the questions raised during the case indicate that this type of activity is a good learning environment. Not only were the trainees required to know and understand the legislation in place, but they had to interpret the information to work out whether 2 individuals from the signatory state, who had been arrested, and who used the precursor to make sarin in the non-signatory state could be sentenced under the existing legislation. This required detailed discussion of the law. For many, this was a situation which might actually arise in their countries and they wanted more cases, but ones which raised different issues.

The makeup of the audience was also interesting for the evaluator. The case had been used on other occasions by OPCW (as a sort of standard format) with the same, named, traded precursor. As presented, rather than it being a sarin precursor, the chemical named was sarin itself; the group identified this, pointed out the mistake but also indicated that they were uncertain whether it was a sort of trap to see how alert all were. But the presenter acknowledged that it was no trap, that he had got away with using sarin, instead of a precursor, in numerous previous presentations, but would now correct it, the error having been pointed out.

Given the time constraints for the lecture, and case discussion, it is difficult to see how more cases (which participants would like to have) could be fitted in, but if there is flexibility in timetabling then a different format is in order. Sitting through 3 lectures with detailed content is always difficult and it is hard to absorb all the information presented. But a format which ran as lecture-case-lecture-case etc would be ideal. There are many issues about the CWC which could be used in a discussion after each presentation. Even the general CWC introduction provides ammunition for argument. For example, are riot control agents dealt with appropriately? What should be done about incapacitant agents? And lecture 3, on the current status of implementation could lead on to a case, or discussion which might involve trade in chemicals between countries with uneven legislation.

The case discussed in this section is ideal training material and it seems clear that it will be used by trainees in their own institutions to highlight Articles VI and VII.

Recommendation (i): The presenter of the ‘legal ‘ lectures (OPCW or VERIFIN) prepare more cases for discussion by trainees.

Recommendation (ii): Provide a final version of all cases (in Powerpoint form or something similar) to all trainees to use for training in their own institutions.

Recommendation (iii): VERIFIN to consider scheduling of lectures about CWC and legal issues.

Given comments from previous trainees about a desire to know more about the effects of chemical weapons one approach which could help to break up the 3 lectures, have a more interactive format as well as cover the effects of chemicals is to have groups prepare posters.

Divide trainees into groups of 2, or preferably 3, and allocate each group a different family of chemicals from irritants (chlorine, phosgene) ; asphyxiants (hydrogen cyanide, cyanogen chloride); vesicants (sulphur and nitrogen mustard); nerve agents (sarin, VX, Novichoks (?)) and possibly riot control agents. Number of trainees will dictate how many groups are possible. In their groups have trainees look up information about the chemicals and cover CWC schedules, hazardous properties, signs and symptoms of exposure, CAS Nos, industry use and protection. Depending on how detailed VERIFIN would like the posters to be perhaps allocate some time, each day, or every other day, over a week or so for this poster work. This has the advantage of changing the pace of work and participants generally like the interactive work. Towards the end of the final poster preparatory session have each group present findings. Offer to photograph each poster and send to all participants.

Recommendation (iv): Have trainees work in groups to prepare posters about chemicals used as weapons.

Assessment by evaluator of Electronic Declaration Information System (EDIS) presented by OPCW

The final lecture on Day 3 was by OPCW staff member Marko Banjanin from the Data Analytics, Report and Quality Control section of OPCW’s Verification Division, Declarations Branch. Banjanin introduced trainees to both the new Electronic Declaration Platform (EDIS) and the Secure Information Exchange (SIX). EDIS will replace the OPCW’s previous Electronic Declarations Tool for National Authorities (EDNA). Learning about EDIS was one of the principal reasons participants wanted to attend the NACD course; they were there to learn what data was to be submitted on chemicals and chemical plants, in which form and using what particular entry criteria.

The full EDIS platform will be completed and launched in 2020, but sections covering Articles VI and III declarations will be available before this, with the final release accompanying details related to inspections and inspectors will be allowed to enter data directly without having to transcribe information from notebooks. Once up and running the system will save time and be far more accurate.

From an observer's perspective the 1-hour presentation , which although mainly about the general development of the electronic platform , with a more complicated presentation about SIX was just too much at the end of a full day.

On the second day, the beginning of an allotted further 2-day programme participants were introduced to a group exercise in which they would submit declarations for a number of simulated cases involving chemicals and chemical plants.

The room was divided into 5 groups, two with 3 participants and three with 4 . Each group had access to a computer with the EDIS software. Marko Banjanin explained that EDIS requires users to identify those with particular roles which, in turn, limits their access to certain sections of any data submitted. National Authorities (NA) will have to decide these roles so for the exercise each group, acting as a NA, would decide who was the Declarations Administrator, Declarations User and the Industry User. Having decided who was who, each had to understand the scope of each role and then identify chemical plant sites and chemical plants. This was followed by the Declarations Administrator creating the necessary records for access to the system, creating users with each undertaking their specific role. Once these administrative formalities were completed groups could now work on each of the simulated cases and make a single declaration for the whole group.

The cases were quite varied and included 'Declaring an OPCF site as a Declaration Administrator'; 'Declaring a Mixed Plant Site as an Industry User'; 'Declaring an OPCF Plant Site as an Industry User'; and 'Declaring RCA as a Declaration User'.

Some groups with more experience of the previous EDNA system were able to test the system in different ways, such as working out how entries would be made for schedule 1 chemicals, which were not part of the allocated exercises.

However, all groups struggled at the beginning of the exercise because it was unclear where data needed to be input and where information could be located which would, in turn, help determine whether a declaration was necessary at all. It would have been a benefit to all if some of this preliminary work had been shown on a projected screen with the lecturer working through 3 or 4 examples and showing exactly where to put data and where to find information in allied databases.

But despite these initial limitations working through the cases was a very interesting for all participants and challenging for most. The variety of cases also added to the thinking required to clarify issues. For those with experience of EDNA the declarations were clearly easier.

The second day allocated to group work with EDIS was timetabled as 'Advanced exercises' with EDIS and SIX, but it appears that it was only a 1 and ½ hour session on SIX that trainees were exposed to. There were no other 'advanced exercises' on EDIS. As a whole day had been allocated for this work it would have benefited all to work on further cases, particularly as some participants, far less familiar with the electronic entry system, were requesting access to the EDIS software for up to a month in order to become really familiar with it, for they, in turn, would be required to train colleagues in their own NAs. This group represented a good proportion of participants.

Even if all the simulated cases had been completed it would not have been difficult to have the groups either separately, or collectively, make up additional cases with different chemicals and circumstances to reflect what was billed (by OPCW) as more advanced work.

OPCW should be advised that it both needs to revise aspects of its presentation about EDIS to take users through the data entry aspects, the mechanics of it so-to-speak, in a step-by-step process before asking groups to prepare declarations on simulated cases. And far more cases covering a wider range of entry requirements are needed for training, even if some duplicate one another in certain aspects. The data entry required for the declarations on the simulated cases is an excellent training approach and allows those practising with it to understand how the system works. What is required is finessing to make the training even better. As the NACD course is an excellent window for OPCW to do increase familiarity with its electronic data entry systems every moment of the time available should be used for training.

Recommendation (v): Before allocation of cases using EDIS and or SIX software OPCW presenter to demonstrate on projected screen how data should be entered and where information can be found. Repeat several times with increasing complexity.

Recommendation (vi): OPCW increase the number of training cases considerably, and prepare cases of increasing complexity.

Recommendation (vii): Following any training on EDIS, or SIX, trainees be provided with access to software relevant to these databases to enable practice for up to 4 or 6 weeks

Assessment of comments from trainees on 2nd week of NACD course plus recommendations from evaluator.

Questionnaires were sent to all 15 participants (See Appendix 4, page 52) but responses were only received from 7 individuals.

Lectures and demonstrations in week 2 of the NACD course were scored between 4 and 5 (on the Likert scale) indicating considerable satisfaction with what was presented (See Appendix 5, page 55).

Several trainees expressed a wish for some field trips to chemical plants to understand what inspections entail. This would be difficult for VERIFIN to organize as there are so many legal issues to consider. However, given advances in virtual reality, it should be possible to prepare a virtual inspection process. This would help trainees, be fun to experience, and might be something to consider in co-operation with OPCW which could make use of such a tool in other training programmes with National Authorities (NAs).

Recommendation (viii): Consider developing a virtual reality inspection process of a chemical plant.

Views about the discussion on good governance varied. Most liked it, thought the discussion good, and that there was sufficient time for this. Another trainee thought the discussion irrelevant for NAs and that this is an issue for NGOs. It might have been helpful to have had a little more discussion on this topic to persuade doubters (See Appendix 5, page 56).

Recommendation (ix): Consider where to modify presentation to make the case that corruption very much an issue for NAs and also consider if sanctions and embargoes can be covered in presentation. Make time for these changes to be covered in presentation and for sufficient discussion.

Access to some chemical databases appears to have been a problem with one in particular not available. Perhaps the day before check that access will be possible on the day of the exercise. For some, more exercises involving searching databases would be helpful, but others considered the time adequate. For those who considered the time adequate it is more likely that they are familiar with these types of searches. The responses probably reflect varying degrees of experience amongst trainees, always something to be aware of. All were in no doubt about the value of database exercises (See Appendix 5, page 57).

Recommendation (x): Ensure all databases to be used are accessible before course starts.

The computer programme for drawing chemical structures is considered essential by most but it appears to be a more complicated tool with some trainees requesting being taken through it step-by-step. There is a need to consider to teach this programme on chemical structures to ensure all follow.

Recommendation (xi): Consider how best to teach computer programme on chemical structures to ensure complete understanding.

7.0 Laboratory skills enhancement for the analysis of chemicals related to the Chemical Weapons Convention (CW-LSE) on Nuclear Magnetic Resonance (NMR) Spectroscopy.

Evaluator comment on previous courses

The second of these courses in which trainees receive lectures, observe demonstrations, undertake practical exercises and sit a test at the end of the course was run in 2017. For this 2017 course OPCW selected 4 participants (see Appendix 6, page 60).

Viewing the training programme it is apparent that after the introductory lectures over the first 3 days that there is a significant emphasis on practical work with exercises involving analysis of spiked samples. OPCW proficiency test requirements are discussed in detail with the course concluding with instruction on the maintenance of an NMR spectrometer.

Feedback from participants rated lectures and exercise with high scores between 4.5 and 5.0, testimony again to the value attributed to the training. Three of the institutes where participants were based had NMR instruments and the fourth was about to acquire this equipment. A benefit analysis indicated most considered that their laboratory needed to improve procedures following what they had learned on the course.

Two of the four participants would have liked a longer course to get more hands-on experience with another suggesting more training on maintenance and troubleshooting. These ideas will be considered when future courses are planned according to VERIFIN.

VERIFIN has considerable expertise with NMR and on most courses provides training on troubleshooting and maintenance. This training is very valuable for any laboratory scientist as it can save considerable sums of money and equipment downtime. Given that most of those attending the course had some experience of NMR consider if some of the theory (lectures) can be reduced or that those attending be required to read theory before starting and some test/discussion take place early in the course to assess understanding and in this way free up more time for maintenance and troubleshooting.

OPCW's financial payment to VERIFIN was again modest and to cover largely accommodation costs. OPCW paid participant travel costs and provide all with a modest daily allowance.

Recommendation (xii): Consider how to provide more course time for troubleshooting and maintenance of NMR equipment.

Evaluator assessment of 2019 course

I spent 2 half days observing the training on this programme in 2019 towards the end of course and interacting with trainers and trainees.

My first impressions of the group were that it was like a small research team. I saw 6 heads bent down observing information on screen. It was a clearly collaborative working environment.

On the Wednesday (18/9) the group was looking at the type of reports which would have to be returned to the OPCW. They were looking at data entry and made to appreciate the complications with some of the available software and the absolute need to check and recheck information. There was superb interaction and good responses and explanations to the many questions asked.

The work observed was very informative, and iterative, with trainers and trainees working well together to take matters forward.

Helpfully for me, the trainers provided a slot in the training programme on Thursday (19/9) which enabled me to spend quite some time with each trainee, and this was valuable as I was able to get a more in-depth appreciation of their take of the course . It is also why there is much more extensive feedback from each individual trainee.

I have not duplicated the responses here and the detailed views are to be found in Appendix 7, page 61.

Assessment of comments by trainees on CW-LSE-NMR course plus recommendations from evaluator.

The scores of 4.2 to 5.0 on the Likert scale for the individual presentations and training sessions indicate, once again, a high degree of satisfaction with the lectures and material presented (For details see Appendix 7, page 61) . The practicals were considered 'superb', a rating that would be hard to improve on. But some found the initial lectures provided information of increasing complexity, too rapidly. Assigning reading matter ahead of time and checking how much was understood when trainees attend lectures will give the lecturer a 'feel' for where to emphasise points, or give over more time to an issue.

Recommendation (xiii): Consider providing reading matter ahead of time and using initial lecture to judge what issues present problems for trainees and use this information to assess where to provide additional explanation.

The trainers on this programme are to be commended. The praise from the trainees for the way in which trainers worked with them and explained issues, is fulsome; the trainers should feel very pleased with this response.

A number of valuable points were raised in the discussion with trainees and these are worth considering. Time is tight on a 2-week course but trainees would clearly like more time for shimming, report writing, and QC/QA. Clearly for most of this to happen, and for trainees to be able to work individually, they each need access to a computer. The evaluator does not know if it is possible to have computers working in tandem, or whether some of the work can be transferred to a 2nd, or even 3rd computer. This is worth considering.

Recommendation (xiv): Consider how to enable more practical 'hands-on' work to facilitate training on shimming, report writing and QC/QA.

Recommendation (xv): To facilitate the above consider where homework could be provided to save time. Report writing, for example, might be a homework assignment.

There was a need to understand more about the monitoring process for chemicals in CWC Schedules 2 and 3. Consider setting homework on this issue and discuss issues the following day.

Recommendation (xvi): Consider setting homework on chemicals in Schedules 2 and 3 and discrete organic chemicals.

There were suggestions for more work as individuals on problems rather than just group work. But this may be difficult to achieve on this course, but is an issue to consider. However, there clearly appears to be a need to work on materials of more complexity, and given the increasing recognition of the value of NMR, VERIFIN, in addition to what it already offers, should consider introducing a further course on NMR on more complex matrices and benchtop NMR equipment, but only for those with experience in this form of spectroscopy.

Recommendation (xvii): VERIFIN to consider introducing a more advanced course on NMR for experienced users and dealing with complex mixtures.

8.0 Laboratory skills enhancement for the analysis of chemicals related to the Chemical Weapons Convention (CW-LSE) on Quantitative Mass Spectrometry (QMS)

I again spent 2 half days observing training on this course and found opportunities to talk to trainees individually and in groups over lunch.

During the exercise on Wednesday (18/9) to clean part of the Agilent GC each step of the procedure was clearly demonstrated and actions explained by the trainer. Participants were advised to clean the injection port and cone after every 50 – 100 samples. But the nature of the samples has to be taken into account when determining how often to clean and it may be

necessary to clean more often, and to clean even when instruments are not in use to ensure they are always ready.

Part of the equipment was removed for cleaning and participants were able to view each action and taken through the whole process step-by-step. It was also made abundantly clear that regular cleaning made subsequent cleanings easier. It was also explained where cleaning might have to be more robust and where delicate parts of the instrument required gentler approaches. There were many questions from participants and fulsome answers given. The commentary from the trainer was excellent, and very clear.

During the process to explain how to clean it was noticeable that one participant photographed each step, whereas some of the others drew pictures in their own notes. Given that the activity is one all found helpful, and that many are likely to undertake in their own laboratory, it is worth considering making a video of the process (with commentary) that participants could take back home. This would provide them all with the reassurance that they had an accurate record of what was done.

Recommendation (xviii): VERIFIN to consider making a video, plus commentary, of the troubleshooting and maintenance aspects of the training it provides and making this available to trainees, perhaps even placing it online.

The second part of the morning was given over to a discussion on trouble-shooting about problems participants might encounter when using GC-MS equipment. There was a good discussion about learning from mistakes, the need to record all problems encountered and the solutions arrived at so that there was a record available for everyone to consult, as others were quite likely to experience similar difficulties. Doing the type of work VERIFIN does it is crucial that it has good records and QC and documents everything, unlike some research laboratories perhaps, and these points were made time and again.

The need to inject blanks onto columns to prevent any risk of one analyte being carried over to the next being measured was emphasised repeatedly.

There was discussion about the proficiency testing VERIFIN undertakes when it receives samples from the OPCW. It was explained that the group receives 6 environmental samples and 6 biomedical samples. The analysis is qualitative ie it is identification of what is present, not how much is there. The laboratory spends the first week screening the samples and confirming identities of what is present and week two documenting everything.

Just as VERIFIN does most of the maintenance work on its equipment, thereby saving both time and expense, so too did most of the participants on the course. Participants resorted to manuals and on-line videos for help on maintenance and some companies (such as Agilent) provide these videos. It is not clear to the evaluator whether the manufacturer videos cover all the training which VERIFIN provides, nor indeed the message that a considerable amount of maintenance might be done in house. Manufacturers are not always keen to advertise the fact that users may maintain equipment rather than send it to the company to have the work done. Consider this point in relation to recommendation (xviii).

However, for some participants maintenance is done by the service provider once a year, and it is not uncommon for equipment to lie idle for 6 months as approval for a maintenance engineer to service equipment necessitates approval through 'many channels'.

For many, it takes months to acquire reagents and equipment.

It was noticeable that for much of the discussion in this 1 -hour session that only 3 of the 6 participants took part actively. The three who said little, listened attentively, but it would have helped to draw them into the conversation as they would have had questions to ask and interesting problems too. In future, whoever is running this section, could perhaps keep a mental note of who is participating and then at some judicious point ask some of the quieter participants a question directly. These need not be a question that is in any way embarrassing, merely something along the lines of: ‘What problems have you encountered?’ or ‘What maintenance do you feel confident undertaking’. All that is needed is an approach to draw people into the conversation and once someone has spoken they are more likely to do so again, albeit on occasions, with a little additional prompting.

Recommendation (xix): Note who is contributing to discussions and ask specific, but non-confrontational questions, to draw everyone into the conversation.

On Thursday (19/9) morning participants were involved in a further calculation exercises including drawing a calibration curve, performing calculations based on area under the curve of the internal standard, and calculating standard deviations, standard error, relative error and recoveries.

The exercise is necessary for reporting of results and all need to know how to do it. The trainer was constantly checking to ensure participants had managed each individual calculation before continuing. She did this by moving round the room to check each person’s results, a reassuring action for the participants and ensuring none were left behind. As some were more familiar with Excel spreadsheets, the calculations were easier for them. Once they had completed the particular section they were able to help others. Teaching others is good for the one doing the teaching and so is a good training exercise.

But this may have to be balanced by the needs of the group and so it may be helpful at the beginning of the exercise to divide participants into two groups, say, according to their knowledge of Excel. The more knowledgeable group might then proceed at a faster pace, do more, but similar exercises, and be less frustrated. The aim overall is to have all be able to manage the necessary calculations and to be able to explain their value, such as why assessing repeatability enables identification of the lowest level at which the error is sufficiently low to enable reporting of a result.

Recommendation (xx): Consider splitting trainees into groups according to knowledge of Excel and assign work accordingly.

During the class participants found an error in the calculations on the board and this was corrected. To be able to find the error participants had to know what they were doing and this is helpful feedback for the trainer that the process they are demonstrating is understood.

Two observations may help for future courses. Participants finding the error provides reassurance that they understand what they are doing. So deliberately incorporating errors into results presented on screen and have participants discover these might be further evidence that the process was understood. It also makes for more interesting teaching and participants could be encouraged to check with each other once the particular step they were undertaking was clear.

Recommendation (xxi): Deliberately incorporate errors into class exercises to have trainees find these.

Another suggestion is to have participants explain what the value of each calculation step is. So rather than the trainer say what standard deviation, standard error, relative error, etc are used for have the class explain their value. So ask: 'What can you learn from the Standard deviation and standard error? What does it tell you? Which results should you repeat? Why? etc'. The class could be divided into groups and the groups discuss this and report back to the whole class. This approach encourages interaction and is an enjoyable process. It is also a good bonding process for any group, but it was noticeable from the way participants helped one another anyway that there was an excellent relationship between them.

Recommendation (xxii): When doing exercises to check results ask trainees at each stage why each step is necessary and what it reveals.

Assessment of comments by trainees on CW-LSE-LC-MS course plus recommendations from evaluator.

With scores of 4 to 5.0 on the Likert scale there is, yet again, clear evidence that trainees both enjoyed the individual elements of the course and were impressed with what they learned (see Appendix 8, page 66).

The LC-MS protocol was clearly a success as all could be achieved in one day, however the GC-MS protocol clearly required almost 2 days and this is simply because of the time required to achieve optimum conditions for the analysis. [In technical language this means that collision energies require far more time in GC-MS/MS than in LC-MS/MS and, in consequence, running time per analysis is much more longer for the GC procedure]. To cover the whole process the trainers utilised some data that had been prepared previously, explaining that to not have done otherwise would have required an extra day in the laboratory. The trainers were simply being efficient with their time and trainees were, in fact, taken through the complete GC-MS/MS process. Somehow, a few failed to understand these procedures to optimise the efficiency of the training. It would appear worth considering how to make the explanation about the process clear to avoid any future misunderstanding.

Recommendation (xxiii): Consider what other steps might be taken to ensure trainees understand the steps taken to enable the GC-MS/MS procedure to be completed in one day.

In a group discussion with 5 trainees it was clear that everyone liked the course content and two would not change anything. However, most said they would like a test at the end of the course that incorporated all they had learned. So they would like to be given an unknown sample from a more complex matrix and asked to identify it; it could even be a forensic sample. All recognised that the laboratory used very expensive, and sophisticated equipment, but thought that they could practise their injection skills (perhaps on an orange!) to the point where the trainer was confident that they could do this on the equipment available and inject the sample they were trying to identify. The group did reiterate that some exercise (with an unknown substance to identify) which utilised all they had learned would be very reassuring.

What the group was suggesting was what some call a summative test and which provides the trainer / examiner the evidence they need that the participants have understood what they have been taught.

None of the participants argued for the course being longer than 2-weeks, but questioned whether it might be possible to rejig the current course to incorporate this final test.

Recommendation (xxiv): Consider whether a test, a practical and theoretical one, could be set at the end of the course with the test incorporating all that trainees had learned.

9.0 Laboratory Capacity Building Programme on Analysis and Verification of Chemicals related to the Chemical Weapons Convention with Nepal and Kenya

The Laboratory Capacity Building (LCB) Programme was established to meet specific needs of laboratories in less developed countries. Now in its eighth year the programme trains scientists both at VERIFIN and in the partner country. At present the scheme partners VERIFIN with laboratories in Kenya and Nepal. Previous contracts were with Kenya and Ethiopia. Contracts between laboratories are for 3 years with the current contracts operative between 2018-20.

Tailored to meet the needs of the laboratories twinned with VERIFIN the LCP training programme is developed on a case-by-case basis and aimed at developing skills in scientists working in the partner laboratories. There is an expectation that those trained will, in turn, train others in their laboratories so that it is not just the skills of individual scientists that improve, but that of the institution as a whole. This is what building capacity means.

More specifically, the training should enable the partner laboratories to analyse chemicals related to the CWC reliably and in various media (blood, soil etc) and to use these skills in a more generic fashion to analyse a wide range of chemicals in the likes of food and environmental samples.

There are two aspects to the programme, one of which is training delivered by VERIFIN scientists in the partner laboratory be it in Kenya or Nepal (Ethiopia previously) and the second part is training in VERIFIN's own laboratories.

The training is adapted to the needs of the participating laboratories and has been changed year to year in response to feedback. Reading the reports for the work planned and assessment of what was delivered for years from 2015 onwards it is apparent that training has been provided in a wide range of areas covering analysis of vitamins in foodstuffs; pesticide residues; veterinary drugs; and fungal toxins such as aflatoxin, the last of which is found in foodstuffs kept in mouldy conditions. This is clear evidence of VERIFIN meeting the needs of the partner laboratories.

In terms of the training provided at VERIFIN a major change was the alteration from a 3-week training programme in Finland which ran up until 2017 and which was changed to a 2-week model in 2018. The 2019 programme at VERIFIN was also run over a 2-week period.

Another change was more of a focus on gas-chromatography /mass spectrometry (GC/MS) in 2018/19 and the dropping of training on liquid chromatography/mass spectrometry (LC/MS). The earlier (up until 2017) training was to meet the needs of both the staff in the

Ethiopian Conformity Assessment Enterprise (ECAE) laboratory in Addis Ababa and those in the Government Chemist Laboratory in Nairobi and Mombasa.

The Kenyan laboratories and the Chemical Laboratory of the Nepal Bureau of Standards and Metrology, which are parties to the 2018 -2020 training programme, need training in GC/MS, which is a principal tool in their laboratories, and this is now accommodated in a 2-week training period.

The elements of what have been taught and the programmes followed are to be found in successive reports prepared by VERIFIN on the Training of Chemists from Developing Countries 2015-2017, a report of the same title but for 2018, and the report Training in Chemical Weapons Verification 2018-2020.

It is also apparent reading the feedback from trainees that they thought highly of their trainers and that the training was exceptional. Likert scores for the individual lectures and training sessions range from 4.33 to 5.0 with a 5.0 being generally regarded as exceptional. Any teacher would be delighted with these assessments.

The detailed plans of training and assessment (which covered the period 2012 -2018) are in Finnish and thus largely undecipherable by the evaluator, but these are supplemented by reports back from the laboratories in English, and responses to questionnaires in English as well. Reading the documents it is apparent that much has been gained from the training.

Detailed questionnaires have been provided to trainees some time after completion of training and the responses indicate that not only was the training highly appreciated, but that it has led to significant improvements in many areas. A progress report from the laboratory in Ethiopia for 2016-17 showed that it had established methods for analyzing a range of pesticides and fat soluble vitamins in food- stuffs as well as a significant decluttering of actual laboratory space (In 2016 VERIFIN supplied the laboratory with a range of detailed written methods for analysis of pesticides in fruits/vegetables and honey; veterinary drugs in honey, and vitamins A and D). One of the challenges noted by the head of the laboratory was the loss of senior staff with 4 having left over the 2-year period.

On the last training programme in Ethiopia (13/3 to 17/3/2017) VERIFIN scientists took a range of spare parts, accessories and consumables to the laboratory presumably to ensure that all equipment in the laboratory necessary for the training was operable.

Similar reports are available on the training of Kenyan scientists both in the country and at VERIFIN. A progress report from a Dorcus M. (full name not possible to discern) notes that there have been ‘tremendous improvements in methods of analysis ‘, more equipment purchased, and improved security in the laboratory (in Nairobi presumably). Attached to the progress report were standard operating procedures (SOPs) which the laboratory had developed following training with these covering procedures for analysing pesticides, aflatoxins and hydrogen cyanide in cassava. Some 18 scientists attended training in Kenya in 2017 with 15 attending in 2018. It is noticeable that the Kenyan laboratory requested training in the analysis of explosives in 2017 and that this was a significant feature of the Nairobi training programme in 2018. VERIFIN has responded throughout to the needs of its partner laboratories.

The number of Kenyan scientists trained over the period 2015-2017, for example, saw those trained and competent to do work with gas chromatography-mass spectrometry (GC-MS) rise from 4 to 14, and rising from 4 to 8 for those working on high performance liquid chromatography (HPLC) . These assessments were made by VERIFIN.

Following training programmes VERIFIN has left laboratories with a range of tasks to be completed within a 3-month period and for the results to be sent back to VERIFIN. It is not possible to assess whether all the tasks set were completed.

For the period 2018 to 2020 VERIFIN has signed Memorandums of Understanding (MOUs) with both the Nepalese and Kenyan laboratories and plan of action for the 3-year period has been set out. VERIFIN has judged the expectations of the Nepalese laboratory as ‘realistic and well-fitting’. This includes training in GC-MS for both laboratories and use of HPLC by the Kenyan scientists. As in previous years a week’s training will take place in the partner country with 2-week training programmes at VERIFIN. Both laboratories have it as a goal to build capacity. E-learning and other internet-based platforms will be used to enhance training and communication.

Comments from trainees on how they have made use of the training received on previous courses

The responses to the 3 questions vary in substance, but it is quite clear that the training received in the capacity building programmes has been put to good use (See Appendix 2, page 35, for detailed responses). Those who attended the training acknowledge that what they learned has led to much better sample preparation and analysis. For some the training led to completely new approaches to sample preparation with improved results (Kakuta; Muthusi; Cheruiyot; Kiraga). There has also been a change in how work is documented with a move by some to record everything from sample receipt to final reporting (Kweyu; Cheruiyot) a testimony to the value of training on the importance of quality control and chain-of-custody procedures.

All respondents attest to the value of the training on routine maintenance and how this has enabled them to do their own trouble-shooting when there is a problem with the equipment; the training provided them with the confidence to undertake this work which, in effect, would be both cheaper for the institution and ensure equipment was available for a longer period in which to perform analyses.

Two of the respondents from Nepal (Nepal, Pohkrel) clearly need further training in both the use and maintenance of GC/MS equipment and have been unable to utilize all of the training they had because of equipment failure. The training programme for the Nepalese scientists is at an early stage and it is highly likely that their needs will be met. The lack of trained engineers in Nepal able to service equipment resulted in the GC/MS having to be sent to another country for repairs and servicing leading to considerable downtime in the laboratory.

Recommendation (xxv): VERIFIN to consider devoting significantly more laboratory time to training and maintenance of equipment in partner laboratories and have trainees demonstrate competence in procedures followed.

Resource issues are clearly a major problem for most respondents and long procurement times for both equipment and reagents are serious limiting factors slowing the rate at which

former trainees would like to work. Resources are not an issue where VERIFIN can have any direct influence, nor is it a problem just restricted to the countries involved in the laboratory capacity building programme; it is a problem for many countries and a serious drag on research and analytical output.

For some (Muthusi) the training has given the laboratory the confidence to acquire a wider range of equipment and hence to increase the range of substances which it can detect.

It is also apparent that some of the trainees have become trainers in turn and that they are passing on what they learned from VERIFIN to their colleagues through training courses in their own institutions (Anyona: Kakuta; Muthusi; Cheruiyot & Kiraga) although it appears that there are a few who have *not* received VERIFIN training who are reluctant to change old habits (Kweyu). One respondent (Kweyu) argued for a rotation system of training to operate to increase the pool of individuals who were trained. This would, he argues, result in a greater readiness to make changes to procedures.

For most respondents some form of continuous training either through direct ‘hands-on’ work, webinars, or e-learning modules is what they would like. For some these may be refresher courses, but for others introduction to different equipment would be useful. It is apparent that all liked the direct work with equipment and this, of course, is the best way to learn as it is learning by doing and information is much more likely to be retained. But provision of additional training clearly has resource implications and it is an issue for funders. However, it could be argued that a minimal additional resource input could help to ‘cement’ the value of the training already provided.

Recommendation (xxvi): Consider whether e-learning or webinars might be used in refresher training.

Evaluator observation of training programme on days 2 and 3 of course

The training approach adopted by VERIFIN was again about how to do analyses well. The trainee group had been given a selection of scientific papers on analysing pesticides and had to read these and choose an approach that was suitable for the pesticides they would be analysing in the laboratory exercise. This was their homework. It is an ideal approach as it avoids spoon-feeding, simulates what the scientists would have to do in their own laboratories and gives them confidence in their approach. The group identified an approach from their reading which was very close to the procedure used in the laboratory exercise. They had to weigh up whether to extract ionic or non-ionic compounds and balance the approach with the costs of particular approaches, the availability of suitable cartridges to use to extract the pesticides from a matrix etc. It was a very problem-solving approach and excellent training. [Regrettably, for copyright reasons the papers reviewed could not be part of the package of material all would return home with].

After the trainees had completed the extraction of the pesticides (working in pairs to do this work) they had the samples loaded onto the GC-MS for analysis. Before the machine, which is automated, can start it needs to be programmed. Much of an afternoon was taken up with the way in which this had to be done. The previous day the group had been talked through the approach and the day following it was their turn. Again it was excellent ‘hands-on’ work with superb interaction, clear explanations about where problems might occur and fulsome answers to questions. These were needed as the software is complicated to use, but it was

noticeable how all 6 trainees were working together and taking it in turn to carry out tasks. The evaluator even noticed the trainees writing down sample details in the laboratory book without prompting, almost as if they had imbibed the laboratory culture by osmosis.

Evaluator assessment of discussions with trainees on 2019 course

As evaluator I had many opportunities to discuss matters with the 6 trainees. It was clear that all 6 scientists felt that VERIFIN was providing training to meet their specific needs and requests (see Appendix 9, page 69 for detailed comments from trainees). The content of the course was what they had requested. All recognized that there was a reciprocal need to build capacity in their own laboratories and that this was a joint goal between their institutions and VERIFIN. They also recognised the need to ensure what they had learned on the training needed to be passed on to others in their laboratory, a requirement for capacity building. Both the Nepalese and Kenyan laboratories are seeking ISO accreditation.

Evaluator assessment of comments from trainees at end of course:

Given that the evaluator was seeing the course at its start, and talking to trainees over the initial few days, it was necessary to obtain views from trainees on completion of their training. An email with questions (see Appendix 10, page 73) was sent to each requesting feedback.

With comments like ‘outstanding’ for the laboratory demonstrations and instructions and ‘excellent’ for the maintenance and troubleshooting training, praise could hardly be higher. It is clear that the trainees found the 2-week course useful, and valuable, and that they felt confident about implementation of what they had learned in a wide-ranging training programme. The examination was considered a fair test of what they had been taught and several seemed pleased with how they had performed (see Appendix 11, page 74, for many more detailed comments).

Although one respondent would have liked more practice with Excel spread-sheets, he was being trained with 3 others and this is clearly something that can be worked on in the home laboratory.

Two of the trainees would have liked more time spent on the GC-MS and one would have liked to use the instrument himself to gain more experience. This is a difficult issue for any laboratory using very expensive equipment and VERIFIN is right to limit access to this when the ability of trainees is unknown. But trainees were able to do data entry and plan how the instrument would be run when they programmed the computer linked to the GC-MS. Furthermore the GC-MS in the Nepalese laboratory is a *Shimadzu* whereas VERIFIN uses an *Agilent* instrument in the training.

Several felt the training on the LC-FLD was too cursory and as it was only a demonstration it was difficult to understand it all. Time pressure may be an issue here, but VERIFIN should look at this section of the training and consider how to improve it, or even leave it out and keep liquid chromatography for a different course.

Recommendation (xxvii): Review training on LC-FLD on LCB programme; other sections of course need no changes as they are meeting a need.

Evaluator assessment of conversation with two trainers who had trained scientists in Nepal and Kenya, one of whom had done this on many occasions (for details see Appendix 8).

There would appear to be a need for some broad agreement about targets – perhaps even at ministerial level. The partner laboratory (in either Nepal or Kenya) would have to be confident that it could achieve these, of course.

Recommendation (xxviii): Set clear targets for outcome of training and how these will be met.

There is a need to ensure that all that has been learned in training is passed on, that there is evidence of this training and how effective it was, and for there to be real capacity building in the laboratory.

Perhaps a checklist of what training has been given can be prepared with trainees required to train others within a 4 - 6 month period of their return and for the training they do to cover all the items on the checklist. This is to ensure training is carried out before there is any risk of trainees either leaving the laboratory of their own volition or being transferred.

Recommendation (xxix): Compile a checklist of training carried out on programme and a firm requirement that trainees train others in home laboratory on all they learned within 4 – 6 months of returning. Seek evidence of effectiveness of this training.

If the laboratory wishes to apply for accreditation there would appear to be a need to inform the ministry, for the need to be recognized by the ministry, and for suitable funding to be made available.

Recommendation (xxx): Help establish process to allow funds to be set aside for accreditation and other laboratory needs.

VERIFIN has adapted its training to meet the needs of the partner laboratories, be it training to identify pesticides, explosives, veterinary drugs, vitamins, toxins etc. But it needs to be remembered that VERIFIN's expertise is in the analysis of chemical weapons. The training it provides for the analysis of other materials is also a generic approach. It is training in HOW to analyse effectively, efficiently and to be confident about the result. This is how it should be and VERIFIN should not feel it needs to analyse every chemical on another country's watch list.

Recommendation (xxxi): VERIFIN is excellent at providing specific and generic training on a range of analytes. It should not feel compelled to expand the range of its training beyond what it considers itself competent to provide.

10.0 Fellowship Programme

I only spoke to one of the two current trainees on the Fellowship Programme and in a more general way (see Appendix 12, page 78). The trainee is from Algeria and he will be doing analytical work which will help in relation to knowledge about explosives. The second trainee is doing work on micro-synthesis and I did not talk to him.

Trainees invited to undertake the Fellowship programme are usually known to VERIFIN and there is dialogue between VERIFIN and the OPCW about suitability of candidates.

However, it is apparent reading the numerous project reports that these have been highly successful for both VERIFIN and the trainee. These projects over a 6-month period enable the trainee to do a good piece of fundamental research to further understanding of an issue. Depending on the topic some of the research will be published in scientific journals.

The research projects follow a timetable in which the first few weeks are spent with the trainee becoming familiar with the laboratory and its system of working before receiving much more detailed instruction over some 4-6 weeks, in a very hands-on manner, about the techniques which he or she will use for the research project. In other words they have a good grounding before they start the research.

Unlike the other 2-week training programmes in which VERIFIN scientists spend the whole time training others with no other return than the satisfaction of a job well done, the fellowships allow the institute to tackle subjects where research is needed and which VERIFIN wishes to progress. Judging by the acknowledgements of the trainees they both enjoyed their project and what they were able to investigate.

11.0 Other Training programmes at VERIFIN.

Over the 2018-2020 period VERIFIN will also provide training programmes to enhance laboratory skills for the analysis of chemicals related to the Chemical Weapons Convention and focusing on issues like Quality Assurance (QA).

The evaluator was only able to assess reports of the courses on Quantitative Mass Spectrometry (and referred to in the next section). These other courses are more advanced versions of what is already in some of the training programmes the evaluator has observed. If the training approach follows what he has seen to date it will clearly be of high quality.

12.0 Courses on the enhancement of laboratory skills on chemicals related to the CWC (CW-LSE courses).

VERIFIN has run 11 of these courses with the last reviewed for the year 2018. Participants are selected in consultation with the OPCW. 8 participants attended in 2015, 4 in 2016, 6 in 2017 and 6 in 2018.

Trainees receive lectures, demonstrations, participate in practical exercises, undertake an examination at the end, and also provide feedback. In response to earlier feedback VERIFIN has significantly increased the practical element of the course to give participants more hands-on experience. This is evident from viewing the course outline where practical work has increased from 2016 onwards. Yet in the feedback for 2018 VERIFIN noted that trainees wanted even more practical work with more time given over to method validation; they also expressed a wish to visit more laboratories and VERIFIN notes that it is not possible to accommodate all this in just a 2-week course. The 2018 course seems to have been very successful particularly because all participants had previous experience with GC-MS and /or LC-MS analytical techniques.

The focus of the course is to increase understanding of the International Organization for Standardization (ISO) requirement ISO 17025:2005 which relates to the quality of management in the laboratory.

Most participants intend translating what they learned into practice in their own laboratories with improvements in chain-of-custody procedures, documentation in the laboratory, training of personnel and recording of such and better handling of chemicals.

Feedback by participants on the quality of the training shows values generally ranging between 4 to 5, scores which are high and a real validation of the training provided.

The evaluator was not able to observe any of the training provided on this course but judging by the feedback responses he noted there would appear to be little requirement to change much about this course.

Although the financial arrangements between VERIFIN and OPCW are not part of the evaluator's terms of reference he cannot but notice that the sums of money received by VERIFIN for the training programmes are very modest and are generally of a few thousand Euros to largely cover accommodation costs; VERIFIN organizes the accommodation.

Recommendation (xxxii): Continue CW-QMS courses in current guise

13.0 OPCW opinion of VERIFIN training programmes

The evaluator was asked to find out OPCW's opinion about the training it provides and detailed responses are to be found in Appendix 13, page 80.

It is quite clear that the OPCW considers the training which VERIFIN provides to be of the highest quality and it values the interaction it has with the organization.

On the technical side VERIFIN is, to coin a phrase, unimpeachable.

It is on the matter of cost that there are issues for OPCW. However, in its report on Training in Chemical Weapons Verification 2018-2020 VERIFIN notes that it is Ministry of Foreign Affairs of Finland (MFA) which largely finances its training programmes, with OPCW covering expenses of the participants including travel, accommodation, a small per diem and health insurance. It is unclear whether it is the cost of supporting individuals which is the issue for OPCW, but this seems unlikely as travel and accommodation costs may not be dissimilar for different venues.

The cost OPCW is referring to is more likely to be the full cost of running training programmes if OPCW is the payer. This is not a matter for the evaluator, he is simply passing on information he received. But it is a matter for VERIFIN, and the MFA.

If VERIFIN is to continue to provide training in other areas, on topics not covered already by MFA financed courses at VERIFIN, then there may have to be a subsidy to VERIFIN to enable it to bid for other OPCW work. OPCW is increasingly stretched for money and has to seek some of the cheapest options. The evaluator has no knowledge of the quality of the training these other groups may provide, however, it is to be noted that an OPCW staff member who has observed the work VERIFIN does, and that of groups in other countries,

considers that VERIFIN clearly provides the best training. The evaluator considers it important that VERIFIN remain one of the principal providers of training on chemicals related to the CWC, simply because it is so good at its job.

14.0 Recommendations:

NACD course

- (i): The presenter of the 'legal' lectures (OPCW or VERIFIN) prepare more cases for discussion by trainees.
- (ii): Provide a final version of all cases (in Powerpoint form or something similar) to all trainees to use for training in their own institutions.
- (iii): VERIFIN to consider scheduling of lectures about CWC and legal issues.
- (iv): Have trainees work in groups to prepare posters about chemicals used as weapons.
- (v): Before allocation of cases using EDIS and or SIX software OPCW presenter to demonstrate on projected screen how data should be entered and where information can be found. Repeat several times with increasing complexity.
- (vi): OPCW increase the number of training cases considerably, and prepare cases of increasing complexity.
- (vii): Following any training on EDIS, or SIX, trainees be provided with access to software relevant to these databases to enable practice for up to 4 or 6 weeks
- (viii): Consider developing a virtual reality inspection process of a chemical plant.
- (ix): Consider where to modify presentation to make the case that corruption very much an issue for NAs and also consider if sanctions and embargoes can be covered in presentation. Make time for these changes to be covered in presentation and for sufficient discussion.
- (x): Ensure all databases to be used are accessible before course starts.
- (xi): Consider how best to teach computer programme on chemical structures to ensure complete understanding.

CW-LSE-NMR course

- (xii): Consider how to provide more course time for troubleshooting and maintenance of NMR equipment.
- (xiii): Consider providing reading matter ahead of time and using initial lecture to judge what issues present problems for trainees and use this information to assess where to provide additional explanation.
- (xiv): Consider how to enable more practical 'hands-on' work to facilitate training on shimming, report writing and QC/QA.
- (xv): To facilitate the above consider where homework could be provided to save time. Report writing, for example, might be a homework assignment.

(xvi): Consider setting homework on chemicals in Schedules 2 and 3 and discrete organic chemicals.

(xvii): VERIFIN to consider introducing a more advanced course on NMR for experienced users and dealing with complex mixtures.

CW-LSE-QMS course

(xviii): VERIFIN to consider making a video, plus commentary, of the troubleshooting and maintenance aspects of the training it provides and making this available to trainees, perhaps even placing it online.

(xix): Note who is contributing to discussions and ask specific, but non-confrontational questions, to draw everyone into the conversation.

(xx): Consider splitting trainees into groups according to knowledge of Excel and assign work accordingly.

(xxi): Deliberately incorporate errors into class exercises to have trainees find these.

(xxii): When doing exercises to check results ask trainees at each stage why each step is necessary and what it reveals.

(xxiii): Consider what other steps might be taken to ensure trainees understand the steps taken to enable the GC-MS/MS procedure to be completed in one day.

(xxiv): Consider whether a test, a practical and theoretical one, could be set at the end of the course with the test incorporating all that trainees had learned.

LCBP course

(xxv): VERIFIN to consider devoting significantly more laboratory time to training and maintenance of equipment in partner laboratories and have trainees demonstrate competence in procedures followed.

(xxvi): Consider whether e-learning or webinars might be used in refresher training.

(xxvii): Review training on LC-FLD on LCB programme; other sections of course need no changes as they are meeting a need.

(xxviii): Set clear targets for outcome of training and how these will be met.

(xxix): Compile a checklist of training carried out on programme and a firm requirement that trainees train others in home laboratory on all they learned within 4 – 6 months of returning. Seek evidence of effectiveness of this training.

(xxx): Help establish process to allow funds to be set aside for accreditation and other laboratory needs.

(xxxi): VERIFIN is excellent at providing specific and generic training on a range of analytes. It should not feel compelled to expand the range of its training beyond what it considers itself competent to provide.

CW-LSE courses

(xxxii): Continue CW-LSE courses in current guise

15.0 Finland's Development Policy supported by VERIFIN training programmes

Finland has a stated goal to support developing countries to help them eradicate poverty and inequality as well as supporting sustainable development. The country supports gender equality, promotes public services and the right to adequate food and water. Finland can help others to meet these objectives. VERIFIN, too, is helping with this process. It trains scientists who work in public service bodies in developing countries and aims, wherever possible, to have parity of genders on its training programmes, and makes OPCW aware of this criterion. Furthermore, the training provided to scientists on its Laboratory Capacity Building Programme, to cite just one example, has covered analysis of pesticides, drugs, vitamins in food, and veterinary drugs. The ability of scientists in developing countries to analyse these compounds accurately will help them meet their public health goals.

16.0 Conclusion

All the points covered under the scope of this evaluation have been integrated with the data obtained after review of the records for 2016 – 2018 and following attendance at three VERIFIN training courses and interviews with course participants.



Alastair Hay PhD, OBE

Professor (Emeritus) of Environmental Toxicology

University of Leeds

12 December 2019

Appendices

Appendix 1 – Questionnaire sent to 70 participants of previous VERIFIN training courses

VERIFIN course evaluation.

Name of participant.....

Email address of participant.....

Course attended and date

Questions:

- 1) How have you used what you learned on the course?

- 2) Have you been able to use all / most of what you learned? If not, why not?

- 3) What would help you , or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

Appendix 2: Responses to questionnaire about how training at/by VERIFIN affected current practice

Email requests on how training by VERIFIN had influenced day-to-day work were sent to 70 individuals who were trainees on the various programmes between 2016 and 2019. In addition 6 emails were sent to laboratory supervisors to obtain up-to-date information on the whereabouts of some participants; some had left the laboratories they were in when they undertook training by VERIFIN and these individuals could not be located.

Fourteen (4) individuals responded to the request for information, a response rate of 20%.

Laboratory capacity Building Programmes

Name of participant **Ermias Ali**

Email address of participant **ermiasali@gmail.com**

Course attended and date **29 October to 16 November, 2012**

Questions:

- 1) How have you used what you learned on the course?

When I took the training I have no detail understanding about the chromatography techniques. After the course am able to prepare sample for chromatography techniques; able to operate GC- MS and generating results and able to do routine maintenance.

- 2) Have you been able to use all / most of what you learned? If not, why not?

I can say yes with little limitation. The limitations are related to resource it is difficult to get sample preparation materials and instrument spare parts in local markets and it takes a long time to import from abroad due to foreign currency and other bureaucracy

- 3) What would help you, or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

Currently, our organization is expanding scopes in residues analysis. For this reason, skilled personnel needs in sample preparation, operation, maintenance, method development and validation and data interpretation. So we need training

Name of participant **GEOFFREY N. ANYONA**

Email address of participant **gnyagaka@yahoo.com**

Course attended and date **29thOctober – 16thNovember, 2012.**

Questions:

1) How have you used what you learned on the course?

I have used what I learned to train my workmates to use and trouble shoot the GC-MS and to do routine maintenance on it. I have also introduced them to new sample preparation methods e.g use of SPEs'.

2) Have you been able to use all / most of what you learned? If not, why not?

I have been able to use most of what I learnt. However, resource constraints (unavailability of analytical standards and certified reference materials, derivatization reagents and solid phase extraction cartridges) in the laboratory occasioned by lengthy procurement procedures have prevented me from applying all the knowledge that I obtained.

3) What would help you, or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

Hands on training especially in use of equipment not available in our laboratory like LC-MS can help boost our analytical capability.

Name of participant...GEORGE MUSYOKI KAKUTA

Email address of participant...kakutageorge@gmail.com

Course attended and date ... Training for Institutional Capacity Building Programme

HELSINKI, FINLAND, 28 September-16 October 2015

Questions:

1) How have you used what you learned on the course?

The following are the areas where I was able to apply what was learned.

- Developed new extraction methods for postmortem samples for drugs, their metabolites and pesticides based on sample matrix by use of Solid phase extraction (SPE) cartridges and syringe filtration, specific for acidic, basic and neutral drugs plus pesticides (organophosphates organochlorides and carbamates) with incredible results compared to the old methods which were based on acid digestion with boiling followed by solvent extraction at different pH values.
- Was able to acquire nitrogen gas evaporator for inert atmosphere concentration of the sample extracts. Initially the process included vaporizing the solvents using heat and therefore compromising the analytes.
- The knowledge acquired resulted into improved operation and the general maintenance of the GCMS instrument including column, septum and liner changing, MSD tuning, water and air leak checks
- Passing the knowledge and materials acquired during the training to my colleagues through training workshops.

2) Have you been able to use all / most of what you learned? If not, why not?

I give a score of 6 out 10 on using what was learned

Reasons;

The institution is unable to service the Mombasa branch GCMS as required citing lack of funds

Lack of LCMS with a library which is the ideal instrument for the biological samples received by the institution despite the many requests made

3) What would help you, or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

I recommend training on LCMS in anticipation of the institution procuring the instrument.

If trained and the instrument availed the acquired knowledge would be useful in determining drugs and pesticide especially carbamates which are our biggest challenge when using the GCMS since most of them require derivatization first which is not the case with LCMS.

Name of participant..... DORCUS NZILANI MUTHUSI

Email address of participant..... dor.muthusi@gmail.com

Course attended and date LABORATORY CAPACITY BUILDING PROGRAM (LCB)

Date ... 21st August to 8th September 2017

Questions:

4) How have you used what you learned on the course?

The knowledge acquired in the course has helped so much;

With the advent and the technical advice of VERIFIN professionals in the LCB programme course, there has been a tremendous improvement in our methods of analysis and several analytical equipments have been acquired which was not the case before. For example;

-GC-MS

-UHPLC

-HPLC

-Centrifuge

-Vortex mixer

-Certified weights for checking accuracy of weighing balances

-water purification system

-FTIR with ATR/DRIFT modules

-Installation of CCTV cameras and biometric locks to ensure safety and security of the institution facilities, exhibits and samples.

The improved methods of analysis has had a positive impact in our work by giving the analysts confidence in using the machines as well as improving the quality, reliability and credibility of our results.

We've developed new methods of analysis and we have been able to adopt better sample preparation techniques.

Results achieved as a result of screening or basic analytical techniques can now be confirmed via the GC-MS or the UHPLC or HPLC methods

We've also put the necessary documentation in place, for example run logbooks, maintenance logbooks, personal notebooks, working instruction (SOPs).

We've adopted and embraced working as a team where we train our colleagues on the new methods developed and the adopted new techniques of sample preparation.

5) Have you been able to use all / most of what you learned? If not, why not?

We've been able to use most of what we've learned, although we've had some challenges due;

- Inadequate supply of consumables
- Inadequate method of sample concentration due to lack of nitrogen concentrator, SPEs cartridges
- Bureaucracy in procurement procedures leading to delay in provision of reagents.

6) What would help you, or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

Further hands on training will help improve the quality of our work and also exposure on the use of state of the art equipments such as LC-MS/MS and GC-MS/MS will further improve the credibility and reliability of our results.

This will help us acquire;

-Accreditation to ISO 17025 for some of the key analytical procedures/ processes, and also benchmark with other international laboratories like VERIFIN.

Name of participant: POLYCARP LUTTA KWEYU

Email address of participant: polycarplutta@gmail.com

Course attended and date: LABORATORY CAPACITY BUILDING PROGRAMME
21ST AUGUST 2017 TO 8TH SEPTEMBER 2017

Questions:

1) How have you used what you learned on the course?

- Planning of experiments is now meticulous in that I take time to prepare for analyses for instance by ensuring all the requirements (glassware, chemicals, literature etc) are ready in advance, unlike before when I would do all these during the analysis time

- Documentation of all activities from sample receipt to final report preparation creating a clear chain of events in specific laboratory registers

- Creation of maintenance schedules for instruments in my workplace enabling periodic maintenance tasks and reduction of damaged or non working equipment i.e. reduced recurrence of errors with our equipment since track of previous issues and solutions are easily available for reference

2) Have you been able to use all / most of what you learned? If not, why not?

- I have not been able to use all that I learned. This is due to:

- Unavailability of some of the equipment at my work station e.g. GC-MS
- Occasional resistance from colleagues on embracing new ways of doing things from their usual routine

3) What would help you, or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

- Continuous provision of additional information through e-learning or physical training would definitely help the institute continue use of the course. It would be ideal if it is planned such that there is rotation of those who attend to increase the pool of trained staff rather than having the same staff always attending the course or having access to these materials. I believe once most people have attended the course are have access to the material then the perception of the new techniques the training offers will gradually be accepted.

- Secondly the institutes administration should be in the forefront in ensuring implementation of the learnt techniques by putting in place monitoring and evaluation measures so that benefits of the course i.e. capacity building of staff to lead in quality work is achieved.

Name of participant.....Abigael Cheruiyot

Email address of participant.....abby9@gmail.com

Course attended and dateLCB , 12th -23rd NOVEMBER,2018

Questions:

1) How have you used what you learned on the course?

- I have improved on sample preparation and methods of analysis .
- I have trained my colleagues on what I learned on sample preparation, procedures, proper use of equipment, running of QC tests, troubleshooting and maintenance of equipment.

2) Have you been able to use all / most of what you learned? If not, why not?

- I have been able to use most of what I learnt.

- Not able to get the right standards.
- Due to challenge in procurement procedures .
- lack of derivatization reagents eg BSTFA.
- unavailability of equipment eg Nitrogen concentrator and SPE.

3) What would help you , or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

- Hands on training because you will be exposed to equipment that may not be available in our laboratories eg LC-MS.
- It's easy to understand what you have been taught practically.

Name of participant.....GEORGE NZAI KIRAGA

Email address of participant.....nzaigeorge@yahoo.com

Course attended and date3rd to 9th April2019

Questions:

1) How have you used what you learned on the course?

I have used what I have learned mostly in extraction and analysis of pesticides in water and environmental samples. In addition, I have applied the extraction techniques with slight modification to extract pesticides in postmortem tissues and other toxicological cases.

I have also trained my colleagues in the laboratory and we have been going through the procedures together.

2) Have you been able to use all / most of what you learned? If not, why not?

I have not been able to use the knowledge especially on extraction and analysis of explosives. This is because our GC-MS turbo fan failed and we are still waiting for funding from the government so that it can be repaired.

3) What would help you , or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

The knowledge gained will assist me in research work as I plan to further my studies. Also, the institution has MoU's with different universities which their students come here for their attachment. I usually teach them the same methods of extraction when we are doing practicals in their respective universities. So the course has been eye opening to us. The knowledge has assisted us in research. I have worked with different students doing their masters' degrees.

Any additional information, e-learning tutorials and trainings will be very helpful to me. This is because, as one of the person handling the GC-MS and other instruments it will improve my extraction techniques, save time and still obtain quality and clean extracts with low interferences. At the end, clean chromatograms and spectra will be obtained.

Moreover, injecting clean samples will reduce the frequency of preventive maintenance hence reducing the cost of maintaining the instruments.

Name of participant: Ranjan Nepal

Email address of participant: nepal0143@gmail.com

Course attended and date: Laboratory Capacity Building Training (GC-MS) : 3rd April 2019 – 8th April 2019 (5 days)

Questions:

1) How have you used what you learned on the course?

Regular working on laboratory for scope extension

2) Have you been able to use all / most of what you learned? If not, why not?

Not completely yet, because our instrument is broken down and as no one repair form country and we have to send instrument to Singapore for repair, instrument is in the process of repairing.

3) What would help you , or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials/ training help you? Please explain how it would assist.

As instrument is quite new in institution and trained service engineer is not available in country, hands on course containing basic maintenance of instrument would help significantly.

More hands on practical training would be fruitful.

Name of participant: Teeka Ram Pokhrel

Email address of participant: pokhrelteeka@gmail.com

Course attended and date: APR 3-8, 2019

Questions:

1) How have you used what you learned on the course?

I learned some theoretical aspects of GC-MS, sample preparation and analysis and some maintenance/troubleshooting.

2) Have you been able to use all / most of what you learned? If not, why not?

I was able to use some of things which I learned. For eg, sample preparation, spectra analysis, cleaning up/change septum etc.

As our instrument broke (Turbo molecular pump broke and not repaired yet), couldn't apply all the things that I learned.

3) What would help you , or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

Our GC-MS instrument need to be repaired and I need hand-on training on maintenance/ troubleshooting as well as analysis of standard and real samples and compare results.

Evaluator Analysis of responses

The responses to the 3 questions vary in substance, but it is quite clear that the training received in the capacity building programmes has been put to good use. Those who attended the training acknowledge that what they learned has led to much better sample preparation and analysis. For some the training led to completely new approaches to sample preparation with improved results (Kakuta; Muthusi; Cheruiyot; Kiraga). There has also been a change in how work is documented with a move by some to record everything from sample receipt to final reporting (Kweyu; Cheruiyot) a testimony to the value of training on the importance of quality control and chain-of-custody procedures.

All respondents attest to the value of the training on routine maintenance and how this has enabled them to do their own trouble-shooting when there is a problem with the equipment; the training provided them with the confidence to undertake this work which, in effect, would be both cheaper for the institution and ensure equipment was available for a longer period in which to perform analyses.

Two of the respondents from Nepal (Nepal, Pohkrel) clearly need further training in both the use and maintenance of GC/MS equipment and have been unable to utilize all of the training they had because of equipment failure. The training programme for the Nepalese scientists is at an early stage and it is highly likely that their needs will be met. The lack of trained engineers in Nepal able to service equipment resulted in the GC/MS having to be sent to another country for repairs and servicing leading to considerable downtime in the laboratory.

Recommendation: VERIFIN to consider devoting significant more laboratory time to training and maintenance of equipment in partner laboratories and have trainees demonstrate competence in procedures followed.

Resource issues are clearly a major problem for most respondents and long procurement times for both equipment and reagents are serious limiting factors slowing the rate at which former trainees would like to work. Resources are not an issue where VERIFIN can have any direct influence, nor is it a problem just restricted to the countries involved in the laboratory capacity building programme; it is a problem for many countries and a serious drag on research and analytical output.

For some (Muthusi) the training has given the laboratory the confidence to acquire a wider range of equipment and hence to increase the range of substances which it can detect.

It is also apparent that some of the trainees have become trainers in turn and that they are passing on what they learned from VERIFIN to their colleagues through training courses in their own institutions (Anyona: Kakuta; Muthusi; Cheruiyot & Kiraga) although it appears that there are a few who have *not* received VERIFIN training who are reluctant to change old habits (Kweyu). One respondent (Kweyu) argued for a rotation system of training to operate to increase the pool of individuals who were trained. This would, he argues, result in a greater readiness to make changes to procedures.

For most respondents some form of continuous training either through direct 'hands-on' work, webinars, or e-learning modules is what they would like. For some these may be refresher courses, but for others introduction to different equipment would be useful. It is apparent that all liked the direct work with equipment and this, of course, is the best way to learn as it is learning by doing and information is much more likely to be retained. But provision of additional training clearly has resource implications and it is an issue for funders. However, it could be argued that a minimal additional resource input could help to 'cement' the value of the training already provided.

Recommendation: Consider whether e-learning or webinars might be used in refresher training.

National Authorities and Chemical Databases

Name of participant...NIYONZIMA Marguerite.....

Email address of participant.....niyomague@gmail.com

Course attended and dateNCDB, August 2017.

Questions:

- 1) How have you used what you learned on the course?
 - I help my NA in elaborating and sending declarations
 - I INTRODUCE SAME NOTIONS RELATED TO THE CWC in the chemistry new curriculum for high schools.
 - I've done a report on the resultants of my training to help the institution understand the OPCW
- 2) Have you been able to use all / most of what you learned? If not, why not?

Not all. Because it was my first time to be trained in such training and understanding all notions in ten days is not easy. Also, I think that I need to complete this course with others courses related to the CWC.

- 3) What would help you, or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

I will be helpful to get more knowledge by being trained for example in analytical chemistry course, assistance and protection. This because my project is to elaborate a module in order to train high schools 'trainers about these notions included in the curriculum, this will contribute to implement effectively the convention. 'if you train, information will reach all the people'

At this moment I work at National Assembly of Burundi and it is an opportunity to interest this institution and it will be benefic for the safety user of CWC as you know bad or good laws are defended there.

I would like to gain more knowledges related to the convention in all courses planed and exchange experiences with other countries.

Name of participant: Mrs Shamira BHEEKHOO

Email address of participant: sbheekhoo@govmu.org

Course attended and date: Training Course on National Authority and Chemical Databases organised by VERIFIN, Helsinki, Finland, from 08 to 17 August 2017.

Questions:

1) How have you used what you learned on the course?

After having followed the course, I have been able to learn how to transmit annual declaration electronically using the SIX and EDNA platform and to acquaint myself with the different chemical databases that are available.

2) Have you been able to use all / most of what you learned? If not, why not?

Unfortunately, I have not been able to use the SIX and EDNA platform to submit the annual declaration of the Republic of Mauritius, in view of the fact that I have not been able to install the software in Mauritius despite that assistance of the OPCW. The one which was installed on my laptop when I was at VEFIRIN was not working while in Mauritius. This has been brought to the attention of the Technical Secretariat of the OPCW.

3) What would help you, or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials/ training help you? Please explain how it would assist.

I was fully satisfied with the Course and the team at VERIFIN is doing a great job. Keep it up.

Name of participant: Hani Salem Morales

Email address of participant: salemhani07@gmail.com

Course attended and date: National Authorities and Chemical Databases on August 2018

Questions:

1) How have you used what you learned on the course?

I have shared the content with my colleagues and we all are using the databases for our work now. Also I worked directly on the Cuban annual declaration to OPCW using EDNA.

2) Have you been able to use all / most of what you learned? If not, why not?

Yes, most of it. The only problem I have is with SIX. In our country the authorities don't allow us yet to use it.

3) What would help you, or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

Maybe with more training even through webinars we can improve our work.

Name of participant: Shree Krishna Silwal

Email address of participant: shreekrishna.silwal@gmail.com

Course attended and date: Training course on National Authority and Chemical Database, 14-23 August 2018

Questions:

1) How have you used what you learned on the course?

- I have been advocating the importance and usage of chemical database in National Authority. Discussion among colleagues and making them aware is enriching experience for me as well.
- I have submitted a report to the National Legislative and so far the feedback is positive to work further on this matter.

2) Have you been able to use all / most of what you learned? If not, why not?

- Due to physical and economical resource constraints in the National Authority, I have not been able to fully utilize my learning as I should have.

3) What would help you, or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials / training help you? Please explain how it would assist.

- There is need of disseminating more information and e-learning tutorials. As there are few people who knows about the importance of using chemical database, more training would help to build more skillful people and it would further help in implementing the teachings.

Evaluator Analysis of responses

Although there are only 4 responses on the NACD courses they are nevertheless helpful.

It is clear that all 4 respondents found the course helpful and improved their knowledge of the OPCW, the role of National Authorities (NA), and the use of chemical databases to collect information to facilitate data entry for annual returns which the NAs make about chemical manufacture or usage. What the trainees learned has also been passed on to others in their institution or in their NA.

For 3 of the 4 trainees what they learned appears to have created a good understanding of what is needed, and some are now involved in submitting data electronically to the OPCW. A difference in software packages has prevented one trainee from submitting data electronically as there appears to have been a difference in what she installed on her laptop whilst attending a VERIFIN course would not work on her return home; OPCW, which presumably provided the software, has apparently been made aware of the issue.

Resource issues appear to be a problem for some and place constraints on what trainees can do when they go home. For 3 of the 4 participants the course seems to have given them what they needed, but for one individual it all appears to have been a little overwhelming and he feels the need to both attend further training courses and to work with NAs in other countries. This suggests that knowledge varies considerably between trainees on the courses and that some thought should be given on how to deal with the disparate backgrounds of participants.

That some follow-up training either by e-learning or webinars would be helpful is clearly something all would welcome. This would be an opportunity to clarify issues and enhance what had been learned on the course. It might also obviate the need for the same individuals to feel that they needed to attend other OPCW courses to acquire the information they need. According to VERIFIN documentation e-learning and webinars have been provided previously.

Recommendation: Revisit suggestion about e-learning or webinars for NACD material or direct trainees to sources where information available.

CW - LSE

Name of participant: Hawine Debela

Email address of participant: dhawidesire@yahoo.com

Course attended and date: The enhancement of laboratory skills in using liquid chromatography-mass spectrometry to analyze chemicals related to the chemical weapons convention (CW-LSE) from May 9 – 20, 2016

Questions:

1) How have you used what you learned on the course?

Answer:

I used some techniques for sample preparation I learnt

2) Have you been able to use all / most of what you learned? If not, why not?

Answer:

- In my organization I was working on LC-MS of Agilent brand, I used some of the teaching for my organization. A person needs more time to be familiar to new software. With different instrument brand the software also becomes different.

3) What would help you, or your institute, to make full use of the course? For example, would any additional information / e-learning tutorials/ training help you? Please explain how it would assist.

Answer:

- It would be more helpful for me if the course has some theoretical part, may be for one or two days before the practical work.

- The course was focused only on chemical weapons and there is no chemical weapon testing in our country so it would be more helpful if the course also relate/ cover testing of other residues related with our work (residues in foods, agricultural products etc)

Evaluator Analysis of response

With only one response to those who attended these courses , and from 3 years previously, it is not possible to make any generalisations. The request for some more theory has been met and the 2019 course clearly provided that.

The use of different software for different instruments is well recognized and may well have placed some limitations on the trainee's learning about the LC-MS. However, it is apparent from the feedback about the 2019 course that trainees liked the practical exercise they performed using the LC-MS and that software was not an issue limiting understanding. It would be impractical for VERIFIN to deal with software packages for a range of instruments; it is more important that general issues on sample preparation, analysis, calculation of results and quality control etc are dealt with.

On the matter of analysis of chemical residues in foods and other agricultural products this is an internal matter for VERIFIN. For some countries which do not have chemical weapons, pesticide residues in food stuffs, and problems with hazardous waste contaminating groundwater may be of much greater importance , but VERIFIN works on chemical weapons. The approach taken on the LSE courses is about how to analyse samples well even though the analytes in question are chemical weapons. It could be argued that it is this more generic approach which is what is important to impart, and it is for trainees to adapt the training they receive to their own needs.

In its Laboratory Capacity Building Programme VERIFIN trains scientists in the analysis of a wide range of substances and in the last two years this has focused on pesticide analysis.

Whether VERIFIN broadens its approach to include analysis of the likes of pesticide residues, and which ones for its LSE training programmes, is for the organisation to decide. This may be an option to consider at a later date. The evaluator does not consider that these changes should happen.

Appendix 3 : Individual comments from trainees on the NACD course and following interviews after completion of the first week and the 3 days of OPCW presentations.

OPCW Legal presentation (Lectures and case discussion)

Participants were asked to categorise the presentations they had from OPCW personnel according to: Excellent/good/satisfactory/ poor and whether they were considered to be essential/informative/not necessary. Responses are available for 13 of the 15 participants who attended.

Legal section

Lectures

12 participants rated the lectures as **Good** and **Essential**

1 participant (who had attended a previous course in The Hague) said the lectures were **Good** but **Not Necessary**

Case

13 participants rated the case as **Excellent** and **Essential**.

EDIS Introduction and exercises

Introduction

2 participants rated the introductory lecture as **Excellent**

4 participants rated the introductory lecture as **Good**

5 participants rated the introductory lecture as **Satisfactory**

1 participant rated the introductory lecture as **Poor**

Exercises

12 participants rated the exercises as **Essential**

1 participant rated the exercises as **Good**

Specific comments from trainees about the legal presentation

- 1) Too many lectures
- 2) Essential. Made us look at Convention. If there were more case discussions like the one we had we would become more expert.
- 3) Need more case discussions in format of lecture / case discussion.
- 4) Need more case discussions in format of lecture / case discussion
- 5) Need more cases. Format should be lecture / case .
- 6) Very practical. Reflects real situation. Case could happen. Enjoyed group interaction. Format ok.
- 7) More cases needed on legal issues. These are very practical and it helps to show how the Convention applies. No safe havens. Forces understanding of the Convention.

- 8) Need cases to learn practical issues even if not all issues are covered. Format ok.
- 9) Case excellent. Learned so much. Very important. Would like more cases and more time for discussion.
- 10) Recently undertook similar training course on implementation (Article VI) in The Hague. Had similar lectures and same case but on a different course. Need different lectures and a different case as well as other cases.
- 11) Very useful. Considered all issues related to import/export.
- 12) If we have more case discussions like this will become more expert.
- 13) Yes the case study helped to understand better the issues. I think it's refers to challenges related to the organization of the NA, and specially the lack of trained personnel at several levels (customs, justice and others stakeholders). However , it's limited only in one case. Others cases can be added such as importation or exportation conditions for mixtures of chemicals containing scheduled 1, 2 or 3 chemicals.

Specific comments from trainees about the EDIS presentation and table top exercises using the on-line access resource

- 1) Need more practice. Like practice very much. Very interesting.
- 2) Need more step by step explanation in lecture. Delivered too fast if you don't know steps. It would be better to introduce the subject slowly by, for example, taking an individual chemical and showing how it is entered on the database, followed by coding steps, where to find information, thresholds etc. If there were more case discussions like this we would become more expert.
- 3) Have come to learn EDIS. Difficult following it.
- 4) Followed lecture. Need more training. In such a short time couldn't follow all and so not able to avoid mistakes.
- 5) Need to know full details so practice essential.
- 6) New to me. Comprehensive information. Practical exercises good and a lot of fun.
- 7) Lecture too long. Most participants would be lost. Maybe do it as a 15 minute talk followed by practicals. Make it interactive. So do a number of cases from the front and get people to enter data (by following what is on the screen) in boxes and showing where information can be found. After 3 examples, say, give out group exercises and get people to enter (data) themselves. The material was good and suitable but it could have been presented differently and been more interactive.
- 8) Lecture needs to be more interactive. Tutor needs to demonstrate on screen with groups entering (data on their own laptop. Do more of this with groups doing the same thing. Then repeat demonstration doing something more complex followed by groups doing the complex tasks.
- 9) Missed lecture (as had to attend hospital). Like practical exercises. Had used EDNA. So none of the practical was a problem. Liked all exercises.
- 10) Could be better.

- 11) The introductory lecture was GOOD but with a high speed in the presentation. About the the practical work : I think we could start with the EDNA System before going to the EDIS system. So, people would gain in experience and be able to compare two Systems. Also, in the practice, each participant would try all roles. So I need more practice.
- 12) The presenter should first perform the task on screen and then get groups to follow. Need to have more emphasis on EDIS, less on governance.
- 13) exchanged email addresses with Marko and can contact him at any time.

General comments received after trainees had returned home.

Albania as a state has been a member of the Chemical Weapons Convention since 1993. Albania is not a state that manufactures chemical weapons, despite the fact that Albania is the first state to destroy its chemical residue.

I would like to provide some of my thoughts and conclusions in regards to this course, as well as suggest a few areas of improvement:

I represent the National Authority and my specific duty is to analyze, review, appraise and inspect the import and export process of strategic goods, military goods and those of dual use.

In the two week period of this course, I would have preferred to have seen actual field inspections, where I could get a more accurate picture of such works and procedures under Finnish legislation.

The lectures were helpful even though many of them were repetitive.

Exercise times and the involvement of the entire group were done in a precise manner even though more practise would be necessary in regards the exercises with EDNA and SIX profile (even though I believe that most of the members from participating member countries have been quite familiar with the meetings organized by OPCW).

The representative of the Finnish Ministry of Foreign Affairs, reported on some specific cases that were not in my interest and that i would not be able to comment in regards to “democracy” or “government corruption”.

I believe that Non Government organizations are the ones responsible for aspect. It would have been of greater interest to me if she spoke in regards to sanctions and embargoes.

Honourable Alastair, I have outlines a course summary above but I would like to see more practicals in future meetings. It would be a lot more efficient if the course material chosen for the training in Helsinki follows the example of another similar course from another member state of the convention. As each member state has the right to be subject to the provisions of the Convention to develop, produce, benefit differently, protect, transfer and use toxic chemicals and their precursors for unbanned purposes by the convention.

This would be a great opportunity to have a clear picture of the articles, main obligations, declarations, consultations, collaborations and the role played by the National Authorities of Member States of the Convention.

Country not using EDIS yet. Has used EDNA. Course will prove be very useful. The exercises were useful. I came here to learn how to use EDIS and learned this. I also talked to Marko (the presenter) on the edges of the presentation. I feel I came to the right course.

Evaluator Assessment of responses

Most trainees rated the lectures on legal aspects of the CWC as either good or excellent and considered that the information was essential. They rated the case discussed as excellent and essential for understanding of the issues and they would like more cases but covering different legal issues. The case requires reference to the CWC articles and, as such, increases familiarity with the convention. Participants also expressed a wish to see a slightly different format for presentations to avoid having 3 lectures on complex issues one after the other.

Just under half the trainees rated the introductory lecture on EDIS as satisfactory, or poor, with the exercises considered essential by the overwhelming majority. The general view was that the introduction was too fast and that trainees needed to be taken through the process step-by-step with the presenter demonstrating on a projected screen how and where to enter data. Trainees welcomed the opportunity to practice but wanted more time for this, more cases and for the process from the introduction to be more interactive. .

Appendix 4 : Questionnaire sent to participants to evaluate 2nd week of NACD course – VERIFIN 19 -22 August 2019

Email sent to 15 participants on NACD course :

Please complete the evaluation below of the second week of the NACD course. Although your name is requested this is simply to check on the number of responses. All returns will be treated in confidence and numbers aggregated.

The scale below for individual sessions is 1 to 5, with 1 regarded as poor and 5 as excellent. Choose the number which best reflects your assessment.

At the end of the timetable for each day there is a section for any general comments. I am most interested in what you have to say about the amount of information given to you and your understanding. Did you, for example, have enough time to discuss issues? Do you need more time? If so, for what? Add anything else you wish to convey to VERIFIN.

Thankyou!

Alastair Hay – Evaluator (University of Leeds)

Evaluation

Participant name :

Timetable

Monday 19 August

Time Subject

09:00 – 10.00 Identification of CWC-relevant activities and national data collection	1	2	3	4	5
- Questionnaires					
- Information sent to stakeholders					
Vesa Häkkinen, VERIFIN, Room B119 Exactum					
10:10 – 10.40 CWC inspections	1	2	3	4	5
Vesa Häkkinen, VERIFIN, Room B119 Exactum					
10.40– 12.00 Activities during CWC inspections	1	2	3	4	5
Vesa Häkkinen, VERIFIN, Room B119 Exactum					
12:00 – 13.00 Lunch break					
13:00 – 16:00 Introduction of OPCW E-learning modules for National Authorities	1	2	3	4	5

Vesa Häkkinen, VERIFIN, Room B119 Exactum

General comments on Monday's activities:

Tuesday 20 August

Time Subject

9.00 – 10.10 Notifications sent by the OPCW – actions required by the National Authority 1 2 3 4 5

Vesa Häkkinen, VERIFIN, Room B143 Chemicum

10.20 – 10:45 Finnish CWC legislation 1 2 3 4 5

Vesa Häkkinen, VERIFIN, Room B143 Chemicum

10.45 – 12.00 Good Governance and Prevention of Corruption 1 2 3 4 5

Annamari Tornikoski, Ministry for Foreign Affairs of Finland, Room B143 Chemicum

12:00 – 13.00 Lunch Break

13.00 – 16.00 Chemical Databases, General introduction 1 2 3 4 5

- Available websites in Internet

- OPCW Handbook of Chemicals

- Browsers

- Search engines

- Practical exercises

Harri Kiljunen, VERIFIN, Room D210 Physicum

General comments on Tuesday's activities:

Wednesday 21 August

Time Subject

9.00 – 12.00 Chemical Databases – practical exercises on searching information on 1 2 3 4 5

- Trade names of chemicals

- CA- and CN-numbers of chemicals

- HS- and EC-numbers of chemicals

- pesticide names

Harri Kiljunen, VERIFIN, Room D210 Physicum

12.00 – 13.00 Lunch break

13.00 – 16.00 Chemical Databases – practical exercises on chemical identification using spectral

Databases 1 2 3 4 5

- NIST

- OCAD

- SDDBS

Harri Kiljunen, VERIFIN, Room D210 Physicum

General comments on Wednesday's activities:

Thursday 22 August

Time Subject

9.00 – 12.00 Exercises related to chemicals identification by trade name and numbers and one for
searching chemical spectra, Room D210 Physicum 1 2 3 4 5

12.00 – 13.00 Lunch break

13.00 – 14.00 Course feedback and discussion

Mr. Vesa Häkkinen, Mr. Harri Kiljunen, Ms. Karoliina Joutsiniemi, Room A128 Chemicum

14.00 – 16.00 Closing Ceremony, Room B143 Chemicu

General comments on Thursday's activities

Appendix 5: Evaluation of 2nd week of NACD course – VERIFIN 19 -22 August 2019

Email requests were sent to all 15 trainees but responses were only received from 7.

Evaluation

Participant name :

The scoring used was the Likert -type scale of 1 to 5 with 1 being Poor and 5 Excellent

(Scaling 1 = poor; 2 = fair; 3= good; 4 = very good; 5 = excellent)

Responses to questionnaire:

Timetable

Monday 19 August

Subject

Identification of CWC-relevant activities and national data collection	4.5
- Questionnaires	
- Information sent to stakeholders (VH)	
CWC inspections (VH)	4.3
Activities during CWC inspections (VH)	4.2
Introduction of OPCW E-learning modules for National Authorities (VH)	4.8

General comments on Monday's activities:

It would be interesting if we could have actual field inspections to get an idea how things are really done. But we were told that that would be difficult.

The activities done on Monday were very good. The only challenge was the WiFi at the campus it was taking long to log in to the E- learning modules .otherwise the participants got the knowledge how to done it. Time was okay

VERY GOOD INSTRUCTION IN THE THEORETICAL PART, IF YOU CAN SEE SOME VISIT TO SOME PLANT TO SEE IN PRACTICE THE INSPECTION PROCESS AND ACHIEVE A BETTER LEARNING AS A NATIONAL AUTHORITY

In generally all topics are very important to me. In the presentation on “Activities during CWC Inspection”, It is better to discuss about what are the sections we have to inspect during the inspection. OPCW E-learning modules are very interesting and knowledgeable topic to me. Here it is more valuable if we had more time to practice.

If possible I would like to get more practical exercises and inspection processes.

Tuesday 20 August

Subject

Notifications sent by the OPCW – actions required by the National Authority (VH)	4.5
Finnish CWC legislation (VH)	4.2
Good Governance and Prevention of Corruption (AT Min For Aff)	4.5
Chemical Databases, General introduction (HK)	4.1
- Available websites in Internet	
- OPCW Handbook of Chemicals	
- Browsers	
- Search engines	
- Practical exercises	

General comments on Tuesday's activities:

We had the opportunity and enough time to discuss our thoughts about the Finnish CWC legislation but also about good Governance and prevention of corruption.

The activities done on Tuesday were also very good . The time for good governance and prevention of corruption was limited.. It generated a good debate and the content was adequate

WITH THE REQUIREMENTS TO THE OPCW NATIONAL AUTHORITY THAT MAY BE ADDED TO THE E-LEARNING AND VERY GOOD INTERVENTION ON GOOD GOVERNANCE AND AVOID CORRUPTION AND WITH REGARD TO THE DATABASES, IT WAS EXTENSIVE TO THE LIBRARY OF CHEMICAL SITUATIONS SO THE INSTRUCTION STEP BY STEP SEARCH EASY THIS INSTRUCTION

Introduction of chemical databases to identify the chemicals are very helpful for me. It is better if we had more exercises to learn it.

The representative of the Finnish Ministry of Foreign Affairs, reported on some specific cases that were not in my interest and that I would not be able to comment in regards to “democracy” or “government corruption”.

I believe that Non-Government organizations are the ones responsible for aspect. It would have been of greater interest to me if she spoke in regards to sanctions and embargoes.

I would like to know how to discriminate and how to do the prevention of corruption.

Wednesday 21 August

Subject

Chemical Databases – practical exercises on searching information on (HK)	4.0
- Trade names of chemicals	
- CA- and CN-numbers of chemicals	
- HS- and EC-numbers of chemicals	
- pesticide names	

Chemical Databases – practical exercises on chemical identification using spectral

Databases (HK) 4.0

- NIST

- OCAD

- SDBS

General comments on Wednesday's activities:

The activities done on Wednesday were adequate. The learning was affected a bit as there was restrictions on some databases. Like for the OPCW OCAD we did not access it..There is need to ensure that access is there before starting the day's activities. The time was adequate.

ON THE CHEMICAL DATABASE CONTINUED WITH THE INSTRUCTION STEP BY STEP TO PERFORM THE BEST SEARCHES AND KNOW - NIST- OCAD - SDBS THAT ALLOWS TO PERFORM A LABORATORY TEST TO KNOW THE REACTION OF THESE IN HUMAN BEINGS AND THE BEST WAY TO AVOID ACCIDENTS IN THEIR USE OR STORAGE

It is nice to have more exercises .If so, we could have get more experience .

This section is very, very valuable and effective for me and our country.

Thursday 22 August

Subject

Exercises related to chemicals identification by trade name and numbers and one for

searching chemical spectra (HK) 4.3

Course feedback and discussion

Mr. Vesa Häkkinen, Mr. Harri Kiljunen, Ms. Karoliina Joutsiniemi

Closing Ceremony

General comments on Thursday's activities

The exercises were a bit repetitive, but interesting nonetheless.

There is need for more practical hands on exercises . the program on the computer how to draw chemical structures should be emphasized to ensure the participants know how to apply or use it. Overall the course feedback and discuss went on very well. The evaluation forms from verifin were completed and handed in. The closing ceremony also went on well. Personally as a chemist I benefited very much from the course and also from the discussion which we had with you Professor on the measures to improve the course. It is my hope that I will be considered for future courses such as associate program and others. My regards.

FOR THE CLASS OF EXERCISES RELATED TO THE IDENTIFICATION OF CHEMICAL PRODUCTS BY TRADE NAME AND NUMBERS AND ONE FOR LOOKING FOR CHEMICAL SPECTRA IS IMPORTANT TO BE DONE STEP BY STEP FOR YOUR BEST UNDERSTANDING

When Considering the whole training programme it had been well organized . Accommodation is very good. helpful staff, nice location, better breakfast buffet.

In the two week period of this course, I would have preferred to have seen actual field inspections, where I could get a more accurate picture of such works and procedures under Finnish legislation.

The lectures were helpful even though many of them were repetitive.

Exercise times and the involvement of the entire group were done in a precise manner even though more practise would be necessary in regards the exercises with EDNA and SIX profile (even though I believe that most of the members from participating member countries have been quite familiar with the meetings organized by OPCW).

I have outlined a course summary above but I would like to see more practicals in future meetings. It would be a lot more efficient if the course material chosen for the training in Helsinki follows the example of another similar course from another member state of the convention. As each member state has the right to be subject to the provisions of the Convention to develop, produce, benefit differently, protect, transfer and use toxic chemicals and their precursors for unbanned purposes by the convention.

This would be a great opportunity to have a clear picture of the articles, main obligations, declarations, consultations, collaborations and the role played by the National Authorities of Member States of the Convention.

Evaluator Assessment of comments

Questionnaires were sent to all 15 participants (See Appendix 2) but responses were only received from 7 individuals.

Lectures and demonstrations in week 2 of the NACD course were scored between 4 and 5(on the Likert scale) indicating considerable satisfaction with what was presented (See Appendix 3).

Several trainees expressed a wish for some field trips to chemical plants to understand what inspections entail. This would be difficult for VERIFIN to organize as there are so many legal issues to consider. However, given advances in virtual reality, it should be possible to prepare a virtual inspection process. This would help trainees, be fun to experience, and might be something to consider in co-operation with OPCW which could make use of such a tool in other training programmes with National Authorities (NAs).

Recommendation: Consider developing a virtual reality inspection process of a chemical plant.

Views about the discussion on good governance varied. Most liked it, thought the discussion good and that there was sufficient time for this. Another trainee thought the discussion irrelevant for NAs and that this is an issue for NGOs. It might have been helpful to have had a little more discussion on this topic to persuade doubters (See Appendix 3 , page ???).

Recommendation: Consider where to modify presentation to make the case that corruption very much an issue for NAs and also consider if sanctions and embargoes can be covered in presentation. Make time for these changes to be covered in presentation and for sufficient discussion.

Access to some chemical databases appears to have been a problem with one in particular not available. Perhaps the day before check that access will be possible on the day of the exercise. For

some, more exercises searching would be helpful, but others considered the time adequate. All were in no doubt about the value of database exercises (See Appendix 3 , page).

Recommendation: Ensure all databases to be used are accessible before course starts.

The computer programme for drawing chemical structures is considered essential by most but it appears to be a more complicated tool with some trainees requesting being taken through it step-by-step. There is a need to consider to teach this programme on chemical structures to ensure all follow.

Recommendation: Consider how best to teach computer programme on chemical structures to ensure complete understanding.

Appendix 6 – Course on the Enhancement of Laboratory Skills in using Nuclear Magnetic Resonance Spectroscopy to analyse chemicals related to the Chemical Weapons Convention (CW-LSE on NMR) 2017.

This was the second of these courses in which trainees receive lectures, observe demonstrations, undertake practical exercises and sit a test at the end of the course. For this 2017 course OPCW selected 4 participants.

Viewing the training programme it is apparent that after the introductory lectures over the first 3 days that there is a significant emphasis on practical work with exercises involving analysis of spiked samples. OPCW proficiency test requirements are discussed in detail with the course concluding with instruction on the maintenance of an NMR spectrometer.

Feedback from participants rated lectures and exercise with high scores between 4.5 and 5.0, testimony again to the value attributed to the training. Three of the institutes where participants were based had NMR instruments and the fourth was about to acquire this equipment. A benefit analysis indicated most considered that their laboratory needed to improve procedures following what they had learned on the course.

Two of the four participants would have liked a longer course to get more hands-on experience with another suggesting more training on maintenance and troubleshooting. These ideas will be considered when future courses are planned according to VERIFIN.

VERIFIN has considerable expertise with NMR and on most courses provides training on troubleshooting and maintenance. This training is very valuable for any laboratory scientist as it can save considerable sums of money and equipment downtime. Given that most of those attending the course had some experience of NMR consider if some of the theory (lectures) can be reduced or that those attending be required to read theory before starting and some test/discussion take place early in the course to assess understanding and in this way free up more time for maintenance and troubleshooting.

OPCW's financial payment to VERIFIN was again modest and to cover largely accommodation costs. OPCW paid participant travel costs and provide all with a modest daily allowance.

Recommendation: Consider how to provide more course time for troubleshooting and maintenance of NMR equipment.

Appendix 7 : Individual comments from trainees on the 2019 CW - NMR course following interviews on Day 9 of the 10-day course.

Scoring for CW- NMR course.

The scoring used was the Likert -type scale of 1 to 5 with 1 being Poor and 5 Excellent

(Scaling 1 = poor; 2 = fair; 3= good; 4 = very good; 5 = excellent)

Section	Score
Arrival/registration	4.8
P. Vanninen (Intro)	4.8
R. Perara (OPCW)	5
Chemical Weapons Convention (KJ)	4.8
NMR laboratory site tour (HH & SA)	5
Intro to NMR (HK & SA)	4.25^
NMR signal processing (HK & SA)	4.25^
NMR Spectrum (HK & SA)	4.25^
Determination of sample matrix by NMR	4.8
NMR techniques for CWC-related analysis	4.8
Sample preparation (am & pm) (SA & HH)	5~
OPCW Proficiency Tests (HH & SA)	4.8#
NMR in OPCW Proficiency Tests (HH & SA)	4.8#
Intro to NMR techniques in CWC – relat. Analysis (HH & SA)	4.8
Screening, characterisation and identification of spiked samples (am & pm) (HH & SA)	5''
NMR data interpretation; Analysis of NMR of spiked of Unknown spiked samples (am &pm) (HH & SA)	5
OPCW Proficiency Test NMR analysis and reporting (am & pm) (HH & SA)	5
Shimming in NMR / Recommendation to NMR lab (HH & SA)	4.2*
QC/QA in NMR Spectroscopy - lecture (HH & SA)	4.2*
QC/QA in NMR – hands-on (HH & SA)	4.2*
QC/QA in NMR – laboratory demo (HH & SA)	4.2*

Notes:

^ Two trainees found the content ramped up too quickly ie that both the information and complexity were increased too rapidly. The lectures were too fast and it was difficult to grasp/understand all the content. This situation could be remedied by assigning reading matter ahead of time. Alternatively, reduce the content in the initial lectures or space them out over the first week.

~ All found the practicals to be superb. They followed a step-by-step procedure and everything was very clear and understood.

“ Spiked samples were loaded in preparation for analysis and data interpretation using software the following week.

The reason why certain functional groups and not others were used and analysed was clearly explained and trainees found this easy to follow.

* Scores only received from 3 of 4 trainees

Evaluator assessment of returned scores

The scores of 4.2 to 5.0 on the Likert scale indicate, once again, a high degree of satisfaction with the lectures and material presented. The practicals were considered 'superb', a rating that would be hard to improve on. But some found the initial lecture content provided information of increasing complexity, too rapidly. Assigning reading matter ahead of time and checking how much was understood when trainees attend lectures will give the lecturer a 'feel' for where to emphasis points or give over more time to an issue.

Recommendation : Consider providing reading matter ahead of time and using initial lecture to judge what issues present problems for trainees and use this information to assess where to provide additional explanation.

Comments from individual trainees

- 1) On 16/9 and 17/9 it was all group work. We analysed processed samples and identified materials. We were assembling data to make an identification of a material. I thoroughly enjoyed the exercise. The work was extended into another day (Wednesday) because there were some contaminants present and the sample had to be reanalysed. We are doing shimming today and did QC/QA on Thursday.
- 2) The group work (on 16 – 17/9) required us to identify structures. We had guidance from facilitators. We were stuck twice and received tips on how to get around the problem. I really liked the exercise. On Wednesday (today 18/9) we did some further practical work and continued a lecture on proficiency testing. The work on shimming was a bit too fast – we need more hands on work on this topic. We also did report writing today but we didn't have enough time for this, only 2 hours but it probably requires 4 hours. For the QC/QA this was only demonstrated and again we need much more practice. The work was done on the computer and only one person was able to practice whereas we all need to do this.

Karoliina's lecture was good but it needs more time and more explanation about Schedules 2 & 3 to set everything in context. So consider giving more time and lecture content to explain

which chemicals are monitored and why this is done. Also consider setting some homework and having the opportunity the next day, or the one following, to ask questions to clarify issues we may have.

- 3) I enjoyed the lectures and it was all new. The practical work on the second Monday and Tuesday was superb, the best part of the course. Revision of lectures does help understanding, so consider setting us some test questions to check understanding and which can be done in a low-key way perhaps a week after the lectures. [NB from evaluator: The final test on the last day of the course did ask questions covering a wide range of material. But what is being suggested here is creating an opportunity to ensure there is understanding whilst the course is in progress. It is an approach used in lectures too to ensure that everyone understands what has been said. In lectures clickers can be employed to allow students to reply anonymously, but coloured cards can also be used for a more low-tech approach. But where the group is small it is much easier to check understanding as the lecture proceeds by simply asking some questions and gauging reactions to answers given.]

The signal processing section, for example spectrum processing and interpretation allowed us to see how the structure of the molecule correlates with the spectra and which multiplicates you would see in the spectra. In other words, viewing the spectra allows you to ask the question: 'Which type of molecules would give this [spectra] ?'. With this work we can see how theory and practice are closely related.

I felt we had enough time for both shimming and QC/QA but I am not overly confident. I would like more time on the computer doing QC/QA but there was not enough time for each of us to practice. We worked as a group whereas it would help me to also do the work individually. We could do group work but perhaps we could each be given a different task to answer : 'I do this because I need to see this.'

- 4) The lectures were excellent and all followed a logical sequence. I followed everything and felt relaxed in the environment and able to understand all the points. I thought the exercise of Tuesday (17/9) where we learned how to deal with particular solvents, and not just deuterated ones, and how to ensure the analyte was not overpowered was brilliant. After it I just thought 'Wow!' I understood which protons related to phosphorus and we were given an explanation on how to screen for the Chemical Weapons Convention chemicals of interest.

I like the strategy for processing a sample. You can scan as is, and if a liquid, be able to identify the different solvents in the liquid. There is no need to do solvent exchange. I learned how to show up the analyte of interest. During proficiency testing you require fast responses and you need to know the solvent matrix.

We had to prepare our own samples at one stage and load these on to the machine, a good experience. When we loaded the samples on Thursday (12/9) we had to set parameters which were relevant for what we were looking for. On the Friday (13/9) we started to evaluate the run and what went wrong. We had to trouble-shoot. It is not always the equipment that is faulty, and sometimes it may not always runs smoothly. We learned the need for patience and good time-management.

On the 16/9 and 17/9 we had an exercise where we had to apply all the theory we had learned and apply it in practice. We found that sometimes theory didn't always fit the practice. We learned how to correlate different spectra and which related to a particular

compound. I liked the group work as we worked well and were able to exchange knowledge. The group size (of 4) was ideal and I really enjoyed the exercise. If we had more time the group could/might consider dealing with a more complex mixture.

In a working environment quality measures are not covered. So this aspect (QC/QA) was ideal as was the knowledge about shimming. Many training exercises do not cover these issues.

I thought the overall plan for the two week training programme was excellent and the sequence of training exercises well thought out. I plan to follow something like this for training exercises I will do.

Views obtained from a discussion with the whole group of four.

We were always able to ask questions. Now more confident about NMR. The practice was ideal. It is easy to remember what you did and easy to do on your own. I am relaxed about setting up an NMR laboratory. We now know that NMR is useful for mixtures. Very pleased with group work and we learned how to identify a compound of interest. A good mixture of theory and practice. We liked the theory/practice/theory approach. And it was good to work in a small group (of 4) and not to work in pairs. The group work was such a positive experience.

We were stuck a little at the beginning of the main group exercise and we did get help to clarify things. The instructors gave us some tips and were always ready to answer questions.

The lectures provided a summary of what is important and do not overwhelm with information. The lectures enable you to get started and there was enough time to think and discuss issues.

We saw different kinds of molecules and understood that theory is not always the same as what happens in practice.

A more advanced course could utilise different matrices, and real materials for the sample preparation. This would be a REAL TEST. But it should only be for those who already worked on NMR instruments.

Work with bench-top NMR would be interesting as it is cheaper and requires less maintenance.

We need to go back home and do some NMR work to integrate all we have learned.

A discussion forum, or website, where we can raise questions and have a discussion with peers would be helpful.

Evaluator assessment or responses

The trainers on this programme are to be commended. The praise from the trainees for the way in which trainers worked with them and explained issues, is fulsome; the trainers should feel very pleased with this response.

A number of valuable points were raised in the discussion with trainees and these are worth considering. Time is tight on a 2-week course but trainees would clearly like more time for skimming, report writing, and QC/QA. Clearly for most of this to happen, and for trainees to be able to work individually, they each need access to a computer. The evaluator does not know if it is possible to

have computers working in tandem, or whether some of the work can be transferred to a 2nd, or even 3rd computer. This is worth considering.

Recommendation: Consider how to enable more practical 'hands-on' work to facilitate training on shimming, report writing and QC/QA.

Recommendation : To facilitate the above consider where homework could be provided to save time. Report writing, for example, might be a homework assignment.

There was a need to understand more about the monitoring process for chemicals in CWC Schedules 2 and 3. Consider setting homework on this issue and discuss issues the following day

Recommendation : Consider setting homework on chemicals in Schedules 2 and 3 and discrete organic chemicals.

There were suggestions for more work as individuals on problems rather than just group work. But this may be difficult to achieve on this course, but is an issue to consider. However, there clearly appears to be a need to work on materials of more complexity, and given the increasing recognition of the value of NMR, VERIFIN, in addition to what it already offers, should consider introducing a further course on NMR on more complex matrices and benchtop NMR equipment, but only for those with experience in this form of spectroscopy.

Recommendation: VERIFIN to consider introducing a more advanced course on NMR for experienced users and dealing with complex mixtures.

Evaluator observations of training.

My first impressions of the group were that it was like a small research team. I saw 6 heads bent down observing information on screen. It was a clearly collaborative working environment.

On the Wednesday (18/9) the group was looking at the type of reports which would have to be returned to the OPCW. They were looking at data entry and made to appreciate the complications with some of the available software and the absolute need to check and recheck information. There was superb interaction and good responses and explanations to the many questions asked.

The work observed was very informative and iterative with trainers and trainees working well together to take matters forward.

NB. Harri and Sini, the trainers, provided a slot in the training programme on Thursday (19/9) which enabled me to spend some time with each trainee and this was very helpful for me as I was able to get a more in-depth appreciation of their take of the course . It is also why there is more extensive feedback from each individual trainee.

Appendix 8: Individual comments from trainees on the 2019 CW -QMS-LC-MS course following interviews on Days 8 and 9 of the 10-day course.

Scoring for CW-QMS course.

The scoring used was the Likert -type scale of 1 to 5 with 1 being **Poor** and 5 **Excellent**

(Scaling 1 = poor; 2 = fair; 3= good; 4 = very good; 5 = excellent)

Section	Score
Arrival/registration	5
P. Vanninen (Intro)	4.8
R. Perara (OPCW)	4.8
Chemical Weapons Convention (KJ)	4.5
Criteria for Quantitative analysis (PV)	4.2
Gen. overview of Quantitative analysis (PV)	4.6
Demo: Spectra from different techniques (PV)	4.5
Gen. overview of method development (PV)	4.3
Calibration and quantitation (hands-on)(KH)	4.6
Instrumentation in quantitative MS (HL)	4.0~
Maintenance of GC-MS (MK & TT)	5"
Chemistry of CWAs (degrad & deriv) (KH)	4.6
GC-MS & LC-MS quality assurance (KH)	4.6
Gen. overview of sample prep for CWAs	4.2
Sample prep demos, use of Int Stds (AP & RU)	4.8^
Sample prep exercise (AP & RU)	4.8^
Method optimisation GC -MS/MS (M Kuula)	4.5*
Analysis GC-MS/MS (M Kuula)	4.5*
Method optimisation LC-MS/MS (M Kjellberg)	5
Analysis LC-MS/MS (M Kjellberg)	5
Cleaning of GC (M Kjellberg)	5
Troubleshooting GC-MS (HL)	4.7
Calculation of results (M Kjellberg)	4.6+
Reporting of results (KH)	4.8

Notes:

~ Several felt this presentation needed some alteration as much of the text on slides was simply read out. One gave it a lower score because they couldn't follow everything.

“ Trainees opened up the GC equipment, cleaned the septum, were shown how to install columns and test the effectiveness of the column installation. Reasons for cleaning were explained. The exercise was said to be detailed and informative.

^ Trainees found the exercise to be very practical. In addition they had plenty of time to ask questions and all were answered.

* All trainees enjoyed the method optimisation and analysis exercises but the GC protocol was estimated to require 19 hours to complete whereas the LC protocol could be done in one day. As trainees had a day working with each instrument they were able to complete the exercise with the LC-MS/MS but some said they had not been able to do this with the GC-MS/MS. However, there clearly was a misunderstanding on the part of some of the trainees. They were taken through the whole analytical process, but as GC analyses take longer than comparable LC ones, a decision was taken to use some previously generated data. Normally this is collected in an overnight run. Had this approach not been followed trainees would have had to sit around for hours waiting for the analyses to be performed. The approach taken by the trainers was a logical one. In future, to avoid any misunderstanding, it would be helpful to ensure all trainees understand why certain measures were adopted. Perhaps get them to explain to the trainers what was done and why. One trainee learned about new software and will use it in their home laboratory.

+ The calculation of results on the Wednesday enabled the more detailed work of reporting on the Thursday.

Evaluator assessment of scores

With scores of 4 to 5.0 on the Likert scale there is, yet again, clear evidence that trainees both enjoyed the individual elements of the course and were impressed with what they learned.

The LC-MS protocol was clearly a success as all could be achieved in one day, but the GC-MS protocol clearly required almost 2 days. It would appear worth considering where some material might be prepared ahead of time for the GC-MS protocol, perhaps with a different batch, to allow everything to be done in one day.

Recommendation: Consider how to amend GC-MS protocol to shoehorn work into 1 day, comparable to LC-MS schedule.

Additional individual comments from participants

- 1) The whole course is at a higher level than calculation of results. For some, however, calculation of results is essential. In general, the course is excellent.
- 2) So far I have enjoyed the calculation sessions (Wednesday am & pm; Thursday am) and all the practicals as they are more interactive. I can get answers to any questions I have and all

the trainers are always checking to make sure all of us are on the same page. We get detailed answers to questions and full explanations.

- 3) I liked the Tuesday (17/9) session as it provides an overview of an experiment (reference here to the LC procedure) . The GC method is much longer and it was estimated that 15 hours is necessary for the whole process. Participants would like to see the whole process including results and all calculations.
- 4) The Wednesday (18/9) pm session was all about calculation of results. But participants are on two levels. Some can use Excel but others are not familiar with it. But the exercise in the afternoon enabled everyone to understand how to calculate results and understand the reasoning and the process.
- 5) I like the general ethos of the laboratory and the importance attached to doing well. I learned so much just being in the laboratory and observing what is being done.
- 6) I learned about the range of instruments available for measurement , how detection is arrived at, the principles behind each mode of detection and above all, what is measured. So I learned a great deal about a range of analytical approaches using a variety of analysers, and approaches to take for polar to non-polar substances. The need for Quality Control (QC) was clearly explained as were the procedures to follow before analysis even starts. I learned about proficiency tests and what you need to undertake as well as what is required to actually confirm the presence of a particular compound. You HAVE to know your matrix an analyse accordingly. We were taught which instruments were good for screening ie the GC/MS/MS and the LC/MS/MS. On my return to my own laboratory I will be looking carefully at our protocols for QC and at our procedures for maintenance and cleaning of equipment to ensure that all work well. I believe we do cleaning well in my laboratory, every 3 days or every week, but we do not document this. But I will ensure that we document this in future. We want accreditation and so we need evidence to support the maintenance work we do.

Group discussion with 5 of the 6 participants at lunch on 18/9.

Everyone liked the course content and two would not change anything. However, most said they would like a test at the end of the course that incorporated all they had learned. So they would like to be given an unknown sample from a more complex matrix and asked to identify it; it could even be a forensic sample. All recognised that the laboratory used very expensive, and sophisticated equipment, but thought that they could practise their injection skills (perhaps on an orange!) to the point where the trainer was confident that they could do this on the equipment available and inject the sample they were trying to identify. The group did reiterate that some exercise (with an unknown substance to identify) which utilised all they had learned would be very reassuring.

What the group was suggesting was what some call a summative test and which provides the trainer / examiner the evidence they need that the participants have understood what they have been taught.

None of the participants argued for the course being longer than 2 weeks, but questioned whether it might be possible to rejig the current course to incorporate this final test.

Recommendation: Consider whether a test , a practical and theoretical one, at the end incorporating all that trainees had learned could be set for the final day.

Appendix 9 – Evaluator discussion and assessment of LCB programme 13,14 November 2019

In a discussion with the 4 Nepalese trainees they informed me that they wanted to learn how to do pesticide analysis so that they were able to screen imported food in their own laboratory. They would also like to screen some exports including honey, coffee, tea and ginger. At present this work is done in private laboratories, often in Europe, and is very expensive. So, a facility for pesticide analysis will be very helpful.

Down time for the GC-MS was 6 months. The maintenance contract did not cover the more serious problem with the equipment necessitating it being sent to Singapore. The laboratory has to negotiate with the ministry for this work to be done. It is a very bureaucratic process which takes time.

It is not possible to have any reserve funds for maintenance, or insurance, to cover any damage to or faults with equipment. There is no experience with insurance in the country. It is also difficult for the ministry to allocate funds immediately as allocation requires approval by other sources, hence the 6-month delay.

The laboratory has a GC-MS from the Japanese firm Shimadzu and only 1 HPLC item from Agilent. Shimadzu had initially trained scientists for 3 days on how to use the equipment, however those trained have been transferred and promoted. The current team have only had 1 person trained more recently over 1 day by a Shimadzu technician. This was at the laboratory's request. However, it is difficult to cover and follow everything in just one day.

Their laboratory already has ISO accreditation (by Indian assessors) for analysis of a range of substances including cement, water, waste water, food products and textiles, but not yet for azo dyes. They want to add pesticides to this list and will build to target ISO accreditation.

The laboratory makes the proposal for accreditation, submits this to the ministry where the final decision is made. Accreditation will cost, hence the need for approval.

Three of the Nepalese scientists have a MSc, a requirement for a chemist's post, and the fourth, a technical assistant, has a BSc. All stated that they wanted to learn the basics, that they were there to learn about the process which they will implement on their return. They want to be able to report a result that they know to be reliable. All want to learn procedures so that they can work as a team. They want to train others in their laboratory and will do this on their return.

There are 14 scientific posts in the laboratory but only 12 are filled at present. The 4 selected to train at VERIFIN were identified on the basis of their work with equipment. There are no female scientists in the laboratory working on equipment relevant to pesticides. The female staff in the laboratory include 1 female chemist, 1 technical assistant and 1 office assistant. For the next visit different staff will be selected.

The scientists said they were there to learn more about sample preparation and analysis. They noted that when VERIFIN staff visited the Nepalese laboratory in 2019 that their equipment was out of action so they worked on sample preparation and theory.

The Nepalese Government has banned 15 pesticides, so the focus will be on these to ensure no food is exported containing residues of these chemicals. Eventually the range of pesticides analysed will be expanded to help with the certification process.

A possible target is to be able to analyse for the 15 banned pesticides in 1 year and seek ISO accreditation for this. In a further 2 years they could aim to have accreditation for 30 pesticides, or even more.

However, ministry approval will be required for the accreditation procedure. All the laboratory can do is propose technical achievements (the goal) but the procedural side will have to be done by the ministry. But the goal is worth going for, all 4 scientists insisted.

When they return they have other routine work to attend to on cement, textiles, water, food products etc. But they will be able to plan time which can be set aside to implement what they have learned at VERIFIN and apply it. They will also train at least 2 others in the techniques they would learn at VERIFIN. They need to have a cohort of trained individuals in case of transfers out of the laboratory.

The group understood the need to build capacity and why it helps to set targets as this helps both them and VERIFIN.

The sample analytical procedures they were learning at VERIFIN are valid for 13 of the 15 banned pesticides they will analyse initially. They have reviewed the literature and identified possible methods for the remaining 2 pesticides. The same approach will be applied to increase the range of pesticides they plan eventually to measure.

As ISO accreditation requires proficiency testing as well, and this is not possible in Nepal, the laboratory will do it with India. This will ensure that results accurate.

The training programme which the scientists were following was what they had requested.

Interviews with 2 Kenyan scientists

Their laboratories have 2 GC-MS items , one in Nairobi and one in Mombasa. The Mombasa machine has been down for some time (2 years). The approval process for repairs takes time!

If the Mombasa group needs to analyse samples by GC-MS they first do the extractions in the Mombasa laboratory and then travel to Nairobi to use their machine; all the preparation and analysis is done by the Mombasa scientists.

The Nairobi laboratory analyses about 10 samples per week for forensic purposes. Mostly this is analytical work on drugs-of-abuse (heroin, cocaine and cannabis [rarely a cause of death]). There is also a need to look for organophosphate pesticides, carbamates and some organochlorines , endosulfan in particular. Most post mortem samples are either from suicide victims or people murdered.

The scientists have to be prepared to go to court to explain their analytical procedures. Most barristers (the legal person examining or cross examining) are only interested in a general explanation, but some do enquire more deeply. Chain-of-custody is not an issue as it is the police who bring the samples to the laboratory. The principal concern is to ensure samples are properly labelled.

Other analytical work is on food and analysing for the fungal toxins, the aflatoxins. The laboratory's work has resulted in 2 shipments being rejected, one with maize and the other rice.

Accreditation has been received for DNA analysis since when the workload in this area has increased.

They are in the process of seeking accreditation for pesticide analysis but it is a long process.

Evaluator assessment of comments

It was clear that all 6 scientists felt that VERIFIN was providing training to meet their specific needs and requests. The content of the course was to meet their needs. All recognized that there was a reciprocal need to build capacity in their own laboratories and that this was a joint goal between their institutions and VERIFIN . They also recognised the need to ensure what they had learned on the training needed to be passed on to others in their laboratory, a requirement for capacity building. Both the Nepalese and Kenyan laboratories are seeking ISO accreditation.

Interview with X – senior scientist involved with in-country training in Kenya

He has been doing training in Kenya for many years.

Given that the Mombasa GC-MS has been out of action for 2 years the question is where the next training will be. It may have to be in Nairobi.

Improvements have happened in the Kenyan laboratories, but very slowly. There are many basic flaws in what they do and in the protocols for documenting everything. For example, there are many loose leaf folders and these are taken from laboratory to laboratory. So, what happens if the file is dropped?

He doubts that there is any real forensic cross-examination about analytical procedures in court. If there were, the procedures would be found wanting.

He feels that it is time to move the training to another country. Kenyan scientists have received training for 8 years with 1 year to go.

Ethiopian and Kenyan scientists both started training at the same time, and at different periods the Ethiopian laboratory was ahead and then it was the Kenyan laboratory moving forward faster. Latterly, it was the Ethiopian laboratory, and principally because of their laboratory manager, who could obtain what was needed.

The Ethiopian laboratory's LC-MS laboratory was very proficient. But then the laboratory manager left to work elsewhere and the laboratory work imploded.

Part of the problem is that laboratories wanted training in very particular procedures, whereas VERIFIN's training was about how to approach analysis and it was then up to the laboratories to adapt and make changes to develop a procedure specific to their needs.

The Kenyan laboratory is now more confident about doing basic essential cleaning and maintenance, rather than having to send equipment away for repair or cleaning, a real money saver for the laboratory.

The Kenyan laboratory talks about accreditation for analysing pesticides, but X does not feel confident that the laboratory is doing much to achieve this.

Evaluator assessment of this conversation and further iterative discussion with a second trainer

There would appear to be a need for some broad agreement about targets – perhaps even at ministerial level. The partner laboratory (in either Nepal or Kenya) would have to be confident that it could achieve these, of course.

Recommendation: Set clear targets for outcome of training and how these will be met.

There is a need to ensure that all that has been learned in training is passed on, that there is evidence of this training and how effective it was, and for there to be real capacity building in the laboratory.

Perhaps a checklist of what training has been given can be prepared with trainees required to train others within a 4-6 month period of their return and for the training they do to cover all the items on the checklist.

Recommendation: Compile a checklist of training carried out on programme and a firm requirement that trainees train others in home laboratory on all they learned within 4 – 6 months of returning. Seek evidence of effectiveness of this training.

If the laboratory wishes to apply for accreditation there would appear to be a need to inform the ministry, for the need to be recognized by the ministry, and for suitable funding to be made available.

Recommendation: Help establish process to allow funds to be set aside for accreditation and other laboratory needs.

VERIFIN has adapted its training to meet the needs of the partner laboratories, be it training to identify pesticides, explosives, veterinary drugs, vitamins, toxins etc. But it needs to be remembered that VERIFIN's expertise is in the analysis of chemical weapons. The training it provides for the analysis of other materials is also a generic approach. It is training in HOW to analyse effectively, efficiently and to be confident about the result. This is how it should be and VERIFIN should not feel it needs to analyse every chemical on another country's watch list.

Recommendation: VERIFIN is excellent at providing specific and generic training on a range of analytes. It should not feel compelled to expand the range of its training beyond what it considers itself competent to provide.

Appendix 10 - Evaluation of Laboratory Capacity Building course at VERIFIN 11- 22 November 2019

The following was sent as an email attachment to the 6 trainees attending the LCB course:

As you know I am evaluating VERIFIN's training programmes and I would be very grateful if you would please provide feedback on the 2-week LCB programme you have just completed.

The form below asks for your name but this is simply to enable me to check where responses have come from. All the results will be compiled and no names will be used. In other words returns are anonymized.

For this feedback I am not asking for an event-by-event return but your views on the whole of weeks 1 and 2 separately.

Week 1 was taken up with the preparation of plasma samples containing pesticides and their subsequent chromatography and identification.

Week 2, on the other hand, was very varied and covered safety, security, data validation, equipment maintenance and troubleshooting, QC and record keeping followed by the visit to MetropoliLab, LC-FLD method development and the examination and feedback.

Please answer as fully as you can as all the returns will be very helpful and every opinion is valuable. The space allocated is only a guide; use more if you have a lot to say.

Thankyou!

Alastair Hay

Appendix 11 - Trainee Responses to questions on Evaluation of Laboratory Capacity Building course at VERIFIN 11- 22 November 2019

Feedback on week 1 : sample preparation and analysis:

Institution: Nepal Bureau of Standards & Metrology, Kathmandu, Nepal

1.

Sample preparation and analysis was fruitful in overall. I learned in hand on sample preparation for pesticide analysis in vegetables and plasma. There were sufficient glassware/chemicals/ reagents and SPE kits available. I felt insufficient time allocated for analysis using GCMS. It would be better if we could have more time individually in handling GCMS.

2.

We prepared sample for GC/Mass in two different matrix(Vegetable and Plasma) and use different extraction method for each matrix which give knowledge that same sample preparation method cannot apply for different matrices. We can use different method based on content of matrix and behavior of analyte in different matrix. We learn to develop GC/MS run method and use quantitation software for acquired data. Although the software is new to us, basics of software are same. Since Solvent standard are supplied already prepared so we could not evaluate in basics of solution preparation such as use of pipette, volume make up, dilution calculation etc. VERIFIN allows us to data calculation ourselves although the time allocated for individual was not sufficient.

3.

During week 1; I had learned about Sample preparation for pesticides in fruits & plasma samples, SPE and their importance, internal standard, GC-MS method development, steps and important factors in SIM & SCAN run method development, types of blank and their uses etc. I also found that the trainers are cooperative and helpful. We had learnt more from the laboratory because we have not a such type of laboratory.

4.

On the first week of our training session, we did the sample preparation of pesticides in tomato and plasma. The way of guiding us on preparing the sample was quite informative. The laboratory was well equipped with sophisticated instruments, glass wares and other relevant equipment. Then we performed the GC-MS method development and analysis on those samples. The demonstrations and instructions made by our trainers were of course outstanding. But what do I believe in my personal view is, if we were given a chance of handling the instrument by ourselves then definitely we could familiarize more with the instrument. Anyway it was a great experience for me, it helped me a lot to get a meticulous details of method development and analysis because this part was the hard corner for me but now I feel more confident in dealing with.

Institution: Government Chemists' Department, Kenya

1.

The training was generally ok. I was able to get new skills that will be of great contribution to me and also my institution.

2.

The following sub topics were effectively handled.

I. CHAIN OF CUSTODY

-This involves coding each and every sample entering the lab. The code is a unique identifier and helps in elimination of sample mix up and any possible errors.

II. SAMPLE PREPARATION FOR PESTICIDES FROM ENVIRONMENTAL SAMPLES

We effectively applied the principle of solid-phase extraction and the use of QuEChER kits and SPE cartridges in separation and analysis of pesticides in tomato samples.

Solid phase extraction is actually column liquid-solid chromatography. The SPE was useful in the sample enrichment and purification. The matrix of interest was screened by GC-MS technique.

III. SAMPLE PREPARATION FOR PESTICIDES FROM PLASMA SAMPLES.

The same principles as that of (ii) above was applied. The principle of separation was applied and the matrix of interest was screened by the technique of GC-MS

Feed back on week 2 : safety, security, data validation, equipment maintenance and trouble-shooting, QC and record keeping followed by the visit to Metropolilab, LC-FLD method development and the examination and feedback.

Institution: Nepal Bureau of Standards & Metrology, Kathmandu, Nepal

1.

The lecture regarding data (method) validation was much more interesting. I earned a lot regarding method validation process. Maintenance part was also interesting as we got involved in maintenance part of ion source, septum, liner, gold plates. Record keeping parts were also useful to follow. Visit to Metropolilab was also useful as we were able to see vegetables sample preparation and processing and different types of analytical equipments.

In conclusion, overall program was fruitful and we will try to implement the knowledge gained during our training and share the knowledge gained among our laboratory colleagues. Regarding exam, we expressed almost what we were taught during this period.

2.

Safety and security lecture is effective and method validation part is comprehensive so that we can apply in our lab clearly. Maintenance and troubleshooting part is excellent and useful for us. QC and record keeping help us to understand the importance of chain of custody. Visit to metropolylab is fruitful exposure for effective handling of large number of sample. LC-FLD method development part is insufficient to understand as only demo is provided. Examination covered all part of training and was helpful to evaluate the understanding of trainee.

3.

During week 2; We had learned about Sample coding and tracking, GC-MS troubleshooting and maintenance, Quality control in laboratory, Laboratory Safety and Security, maintenance of logbooks, Quantitative analysis and method Validation (with some extra knowledge knowledge about solvent and matrix standards, calibration, measurement uncertainty, Precision, Bias, Selectivity, Sensitivity, Robustness, LOD & LOQ etc.), Chain of Custody, Quality assurance etc. We

were also discussed about Decision rule and Risk based thinking related to ISO/IEC 17025. The visit to Metropolilab is crucial for me because I got a chance to see a such type of big laboratory and learnt a bit of their system and technology which is almost impossible in my country. LC-FLD training was normal, not learn more. I enjoyed the examination, but I think mixing of subjective and objective Questions are better than Subjective questions only.

At last, I am thankful to VERIFIN for giving the opportunity in such type of training, for good hospitality also. It is more better in future if they also managed to pick up in airport , because at first time people from developing country don't have much knowledge about system in foreign country.

4.

The 2nd week schedule was a little bit more hectic. To encompass the entire course content within the stipulated time was not sufficient enough though we managed it. Since, we got involved into the safety security lecture theoretically and practically so i got a clear picture of it in my mind. The presentation of data validation was quite smooth and understandable but again I must say that we would have at least one to two examples to be done practically in excel sheet. Now I am able to maintain the equipment and encounter the trouble shooting problem. We have to do the record keeping in our lab also but the format, regularity and traceability maintained there was praiseworthy. We visited the Metropolilab and took a look and brief description of instruments. we got an opportunity to look at the sample preparation area and analysis room. The LC-FLD method development was not so satisfactorily described and demonstrated, the reason behind it might be due to short time allocation to this topic. To the best of my knowledge I did well in my examination and was able to pass the exam successfully.

At last but not the least, this training has become so much fruitful to me. Now i think if i am decorated with the instrument and all the required materials, definitely i can run the testing. So, many many thanks to VERIFIN as well as my institution on providing me such a golden opportunity.

Institution: Government Chemists' Department, Kenya

1.

The units were well covered with very helpful materials.

2.

We learnt the following key areas,

1. GENERAL SAFETY MEASURES IN A LABORATORY HANDLING ORGANIC WASTE.

-The following protective measures are mandatory:

-The analyst must wear personal protective equipment, Laboratory coat, gloves, safety goggles.

-Working under a fume hood.

-Disposal of wastes into designated well labeled containers.

-After analysis of work, all wastes must be effectively decontaminated using 10/100 KOH in Ethanol.

2. EQUIPMENT MAINTENANCE & TROUBLE SHOOTING

Its important that an equipment such as GC-MS is maintained as:

- Vent & cool the instruments.

- Change septum,liner,bottom-plate and syringe.
- Change column or cut 2 metres from the beginning.
- Clean ion source.
- Pump into vacuum-check for leaks and tune.

3. QC AND RECORD KEEPING

Always use the QC test method to be able to compare QC test results.

4. VISIT TO THE METROPOLILAB LABORATORY

On 21/11/2019 we visited the Metropolilab Laboratory. It is a fully accredited laboratory that deals with screening and testing of pesticide residues and other toxins in food samples. The laboratory serves the following regions of Finland, Helsinki, Espoo, Vantar and Kaunianien. It is quite a busy turnover and in year 2018 it recorded sales of over 6.8M Euros.

The laboratory is well Equipped with the state of the art Equipment such as GC-MS-MS, LC-MS etc.

Evaluator assessment of comments:

With comments like 'outstanding' for the laboratory demonstrations and instructions, and 'excellent' for the maintenance and troubleshooting training, praise could hardly be higher. It is clear that the trainees found the two week course useful, and valuable, and that they felt confident about implementation of what they had learned in a wide-ranging training programme. The examination was considered a fair test of what they had been taught and several seemed pleased with how they had performed.

Although one respondent would have liked more practice with Excel spreadsheets , he was being trained with 3 others and this is clearly something that can be worked on in the home laboratory.

Two of the trainees would have liked more time spent on the GC-MS and one would have liked to use the instrument himself to gain more experience. This is a difficult issue for any laboratory using very expensive equipment and VERIFIN is right to limit access to this when the ability of trainees is unknown. But trainees were able to do data entry and plan how the instrument would be run when they programmed the computer linked to the GC-MS. Furthermore the GC-MS in the Nepalese laboratory is a *Shimadzu* whereas VERIFIN uses an *Agilent* instrument in the training.

Several felt the training on the LC-FLD was too cursory and as it was only a demonstration it was difficult to understand it all. Time pressure may be an issue here, but VERIFIN should look at this section of the training and consider how to improve it, or even leave it out and keep liquid chromatography for a different course.

Recommendation: Review training on LC-FLD on LCB programme; other sections of course need no changes as they are meeting a need.

Appendix 12 : Fellowship programme

I only spoke to one of the two current trainees on the Fellowship Programme and in a more general way. The trainee is from Algeria and he will be doing analytical work which will help in relation to knowledge about explosives. The second trainee is doing work on micro-synthesis and I did not talk to him.

Trainees invited to undertake the Fellowship programme are usually known to VERIFIN and there is dialogue between VERIFIN and the OPCW about suitability of candidates.

However, it is apparent reading the numerous project reports that these have been highly successful for both VERIFIN and the trainee. These projects over a six month period enable the trainee to do a good piece of fundamental research to further understanding of an issue. Depending on the topic some of the research will be published in scientific journals.

The research projects follow a timetable in which the first few weeks are spent with the trainee becoming familiar with the laboratory and its system of working before receiving much more detailed instruction over some 4-6 weeks, in a very hands-on manner, about the techniques which he or she will use for the research project. In other words they have a good grounding before they start the research.

Unlike the other two week training programmes in which VERIFIN scientists spend the whole time training others with no other return than the satisfaction of a job well done, the fellowships allow the institute to tackle subjects where research is needed and which VERIFIN wishes to progress. Judging by the acknowledgements of the trainees they both enjoyed their project and what they were able to investigate.

I have looked at the following reports:

Mr Boban Andelkovic . *Evaluation of biomedical sample analysis using NMR*. Undertaken between 1 April – 30 September 2015. Tutors : Harri Koskela, Marja-Leena Kuitunen and Paula Vanninen. (Project established the viability of using NMR techniques to analyse organophosphorus metabolites from biomedical samples at the high ppb level).

Mr Bekkar Djelloul Sayah Zakaria. *Synthesis of precursors, degradation products including metabolites, and by-products of chemical weapons agents*. Undertaken between 21 April – 30 September 2015. Tutors : Harri Kiljunen and Paula Vanninen. (Project specifically on preparation of reference chemicals of sulphur mustard:haemoglobin adducts using less toxic starting materials)

Mr Kostiantyn Shvydenko . *Synthesis of precursors and degradation products including metabolites, and by-products of chemical weapons agents*. Undertaken between 30 May – 30 November 2016. Tutors : Harri Kiljunen and Paula Vanninen. (Project specifically on synthesis of previously unknown reference materials of nitrogen mustard).

Mr Samir Frontino de Almeida Cavalcante. *NMR spectral parameter evaluation and spectrum prediction in different conditions for semiautomated identification of CWC-related chemicals*. Undertaken between 16 October 2016 – 15 April 2017. Tutors : Harri Koskela, Harri Kiljunen and Paula Vanninen. (Project specifically to test different software and their capacity to read and store data on sarin and analysis of a mix of VX, nitrogen mustards and BZ under different experimental conditions).

Mr Shamin Ahmed. *Parameterization of pH dependencies of spectral parameters for selected CWC-related chemicals and preliminary studies of plasma sample analysis using NMR*. Undertaken

between 1 September 2017 – 28 February 2018. Tutors : Harro Koskela, Harri Kiljunen and Paula Vanninen. (Project specifically to use NMR methodology to identify select organophosphonates and sulphur- mustard degradation products in aqueous samples relevant to the CWC).

Mr Mukesh Kumar Singh . *Synthesis of valine adduct of Nitrogen mustard (HN-3)*. Undertaken from 1 September 2017 – 28 February 2018. Tutors : Harri Kiljunen, Harri Koskela, Hanna Niemikoski and Paula Vanninen. (Project specifically on synthesis of a specific valine adduct of nitrogen mustard as the major product and minimizing formation of side products).

Recommendation: The Fellowship programme should continue in its current guise as it is a considerable benefit to both VERIFIN and partner institution.

Appendix 13 - Opinion of OPCW staff about VERIFIN training programmes

As part of this evaluation I was required to obtain views from OPCW about the training programmes VERIFIN provides. Three individuals provided comments. A fourth provided evaluations of OPCW's contribution to the NACD programme and these views are incorporated in the general feedback which VERIFIN received on the last day of the course, and which it has already appraised. This fourth individual was not available for interview in time for the draft report.

As one response is from the new head of the ICA programme it will be helpful to see the email in full and it is reproduced below.

From: Kayoko Gotoh <kayoko.gotoh@opcw.org>
Sent: Thursday, October 31, 2019 4:06:18 PM
To: Alastair Hay <A.W.M.Hay@leeds.ac.uk>
Cc: Karim Hammoud <karim.hammoud@opcw.org>; Sebastien Braha <sebastien.braha@opcw.org>; Bianca Willemstijn <bianca.willemstijn@opcw.org>; Veronika Stromsikova <veronika.stromsikova@opcw.org>; Carolyn Browne <carolyn.browne@opcw.org>; Yasmin Naqvi <yasmin.naqvi@opcw.org>; Li Zhao <li.zhao@opcw.org>; Sergey Zinoviev <sergey.zinoviev@opcw.org>; Rohan Perera <rohan.perera@opcw.org>
Subject: RE: Value of training courses provided by VERIFIN

Dear Mr. Hay,

Greetings from OPCW. I write in response to your email below, in my capacity as (two-week old) Director for International Cooperation and Assistance (ICA).

Though admittedly still very new with OPCW, upon quick review there does not seem a "formal view from OPCW" on specific training providers with whom we cooperate. One of the important challenges ahead for our Division would indeed be to enhance monitoring and evaluation of capacity-building activities it undertakes, so as to be able to properly assess their impact and effectiveness - still a work (to be) in progress!

Having said that, my colleagues relayed to me positive experience in working with VERIFIN, which, of course, is an important partner for us. You may have already been able to gather such views through your contacts referred to in the below. While I am afraid we are unable to offer a "formal" or "official" view as explained above, relevant colleagues from ICA and Verification Divisions would be happy to liaise with you during your CSP attendance.

Many thanks, and best regards, Kayo

*Kayoko Gotoh (Ms.)
Director, International Cooperation and Assistance
Organisation for the Prohibition of Chemical Weapons (OPCW)
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Interviews with 2 OPCW officials involved in some capacity with VERIFIN programmes and drawn from the list copied into Ms Gotoh's email – another senior OPCW official suggested the two who were interviewed at the 24th CSP meeting in The Hague. Their views are:

1.

VERIFIN is highly competent and very technical. There is never any concern about the quality of its work. The laboratory provides top-level training.

I have seen how eager trainees are on the one programme I saw at VERIFIN.

After nominations have been received for participating on training courses at VERIFIN, OPCW does some technical assessment of candidates to help decide who will be put forward.

The Analytical Skills Development course which used to be run at VERIFIN has been moved and will now be run in India. This is not because of the quality of the work VERIFIN does, it is simply a matter of cost.

2.

There is a need to integrate activities between VERIFIN and OPCW.

The same laboratory for which VERIFIN provides training on its LCB programme is being supported by OPCW.

Not all member states are transparent about the support they receive.

The UK is funding the laboratory in Kenya. The money is provided to OPCW to facilitate the support work. The UK has made a large contribution to OPCW to support laboratories in other member states. The UK just provides the money and it gets someone else to do the training.

The UK should talk to the Finnish Foreign Ministry about these support programmes.

All this investment is not efficient. Little use is made of the training received.

Most of the Kenyan laboratory's work is not on chemicals [unclear how chemicals are defined]. There is no potential for proficiency testing.

If the British programme continues there is a need to provide equipment.

The head of the laboratory (Mr Ali Gakweli) is very good, but receives no support from his management. He needs management support.

The funding from the UK may support training for Kenyan and Nigerian scientists.

Nigeria has equipment but no personnel, whereas Kenya has personnel trained but no equipment.

The Swedish or Spanish are other countries which may deliver training.

VERIFIN is expensive and it is lucky to get this programme. No one else is able to deliver.

3.

I have attended as an observer for few VERIFIN courses in last few years and they provide sound practical component and valuable lecture series on Analytical Programmes related to GC/MS (ASDC) and NMR.

Compared to the other programmes offered by the various Institutes such as IICT (India), FOI (Sweden), DST (Australia) VERIFIN offers good courses for participants.

Evaluator Conversations following discussion with OPCW staff.

It is clear that OPCW has a very high opinion of the training which VERIFIN provides. There is no question about the quality of this training. The principal issue for OPCW is the cost to the organization of any training programmes it supports. The OPCW staff spoken to cite the high cost of training programmes in Finland. Cost, for the OPCW, is a major consideration and one VERIFIN will be aware of. But VERIFIN need have no concern about how its training is regarded as it would appear to have no peers; it would appear that VERIFIN is far better than any competitor.