

**FINLAND, SWEDEN, UNITED KINGDOM OF GREAT BRITAIN  
AND NORTHERN IRELAND****STRENGTHENING VERIFICATION THROUGH THE PROMOTION  
OF CHEMICAL FORENSICS AT THE OPCW**

Verification is one of the cornerstones of the Chemical Weapons Convention. A comprehensive, effective, and efficient verification regime helps uphold the norm against the use of chemical weapons by serving as a deterrent against the use of chemical weapons as well as a tool for ensuring accountability.

An efficient verification system is up to date: it should keep up with developments in science and technology through, for example, the use of advanced technologies and continuous development of investigation skills, tools, and procedures. Continued improvement in the technical capabilities and operational capacity of the OPCW Technical Secretariat (hereinafter “the Secretariat”) and designated laboratories is of crucial importance to maintain a high standard of readiness for non-routine missions. In this context, special effort should be put into advancing the field of chemical forensics among the States Parties, the Secretariat, the OPCW designated laboratories, and other relevant stakeholders.

Chemical forensics is described as the application of chemistry and forensic sciences in a legal framework. The aim of chemical forensics investigations is to link a chemical warfare agent or precursor, by-products or degradation products to, inter alia, its source, a particular production route, or a chemical supplier with the ultimate goal of helping to identify the perpetrator of an alleged use or to exclude certain actors of a confirmed use of a chemical weapon. Chemical forensics relies primarily on impurity profiling, combined with statistical comparison of profiles, and/or on comparison of elemental stable isotope ratios utilising a wide variety of analytical instrumentation. Databases and/or appropriate reference samples are important for chemical forensics, but suitable databases are currently limited. Interlaboratory collaboration would therefore be essential for establishing a network of laboratories capable of undertaking such analyses, and for exploring the development and creation of databases. In addition to the above-mentioned methodologies, developing harmonised data processing protocols is important, albeit challenging.

In practice, advancing chemical forensics work would require that interested laboratories, in collaboration with the OPCW, would undergo well-coordinated confidence building exercises. This includes establishing criteria and analysis of sample test sets, as well as focusing on the capabilities of laboratories to monitor persistent contaminants (possibly in very low concentrations) that can be directly attributed to the source or to exclude a source of the target substance. These could include impurities, unreacted precursors and starting materials, by-products, and degradation products. Existing international collaboration between laboratories (both designated laboratories and others) has already resulted in some quality control measures for impurity profiling; however, more work is needed.



Once the relevant methodology for chemical forensics investigations has been developed and shown to be reliable in laboratory-wide testing, it could complement other OPCW verification tools, particularly in investigations of alleged use and related fact-finding activities.

The Centre for Chemistry and Technology (ChemTech Centre) is expected to considerably enhance the OPCW's capabilities. The leading role of the ChemTech Centre in the coordination of the development of chemical forensics methodology and cooperation between laboratories would be essential to promote the matter.

**Recommendations:**

1. The Secretariat should act as a focal point for the development of chemical forensics tools and methods, and support networking of interested laboratories in this area aiming to enhance the designated laboratory network with chemical forensic analysis in the future.
2. The Secretariat should coordinate the chemical forensics research and method development and serve as a forum for sharing the results of related method development for the benefit of the whole community by organising meetings and workshops to promote chemical forensics. Involvement and support to States Parties and other stakeholders is encouraged.
3. The Secretariat should promote discussion regarding the creation of a database (separate from the OPCW Central Analytical Database) of impurities, side products, and starting materials of chemical warfare agent synthesis.
4. The Secretariat should provide training for inspectors on sampling and collecting forensic evidence, including ensuring chain of custody.
5. In the long term, new Recommended Operating Procedures for chemical forensic analysis, including data processing such as chemometrics and statistical analysis methods, should be created and tested in the international interlaboratory comparison tests.
6. The Director-General should task the Scientific Advisory Board to continue its work in monitoring the developments in chemical forensics and providing recommendations regarding future activities.
7. The Secretariat should use its unique view of the international chemical industry to identify emerging trends that may result in new forensic signatures, such as the adoption of flow chemistry or the use of ultra-high purity chemicals.