

## ***Using non-destructive techniques to improve crime solving in Chile***

### ***The challenge...***

The Investigations Police of Chile (PDI) operates the Environmental Forensic Laboratory, a specialized unit that helps to investigate crimes; it also gathers and analyses material that is used as evidence in criminal investigations across the country. Today, crimes can be highly sophisticated and credible evidence is of great importance. However, working with and analyzing evidence presents several difficulties. For example, most available instruments in the country's forensic laboratories lead to specimen alteration or even complete destruction, which means that other examinations of the evidence cannot subsequently be performed.

### ***The project...***

The IAEA is working with the PDI and the Chilean Nuclear Energy Commission (CCHEN) to incorporate nuclear techniques and increase the accuracy of evidence analysis, while complementing conventional methods. Nuclear analytical techniques in forensics have many advantages – they are highly sensitive and accurate. In addition, they are non-destructive — in most cases the evidence can be evaluated without altering, damaging or destroying it.

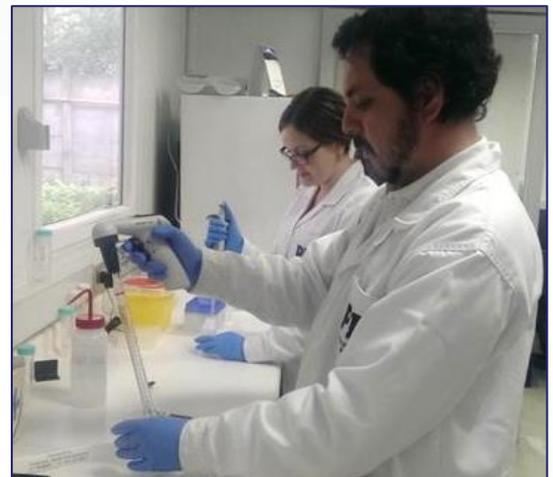
With the support of the IAEA's technical cooperation programme, expertise and training in nuclear techniques and methodologies to support forensic analysis have been provided to CCHEN and the PDI. This includes gaining experience, validation and training in neutron activation analysis (NAA), which can determine profiles of origin using very small samples.

In addition, the project helped to establish national instrumentation capacity for the characterization and exact identification of the crystalline structure of evidence using the X ray diffraction (XRD) technique, a fundamental analytical tool in forensics. The major advantages of XRD compared to other analytical methods are that it is non-destructive, highly sensitive and reliable, and it can be used to analyze many different types of materials, even if preserved in tiny quantities.

### ***The impact...***

The IAEA projects have supported the establishment of a national network that uses non-destructive nuclear techniques for characterization, identification and analysis of forensics specimens. This network is coordinated by the PDI and includes the University of Chile and the University of Concepción. The universities will focus on trace evidence analysis, and CCHEN will focus on NAA and the development of nuclear analytical methodologies. Such methodologies allow the identification of particular trace elements at very low detection limits, which can be used as chemical markers as well as reference technique for other methods.

With the introduction and validation of these nuclear techniques, Chile will gain national capacity to process small samples of evidence with high accuracy and sensitivity, reducing the need to repeat tests due to possible reliability and/or accuracy challenges. Non-destructive nuclear techniques are expected to contribute to the resolution of many unsolved cases, and to increase the percentage of solved crimes in the future.



*Preparing samples prior to analysis using nuclear analytical techniques.*