

Slide 1 Title: crime scene investigation (CSI) and the National Criminal DNA Database (BDN-DNA)

Slides 2 The slide outlines the organization of Forensic Police in Italy including 15 regional or interregional offices and 5 forensic genetics laboratories (Turin, Milan, Rome, Naples and Palermo)

Slide 3 All regional/interregional Forensic offices include a CSI unit, one that process fingerprints and then, variably, chemistry labs that analyze narcotics and forged documents, forensic genetics labs, firearm labs, image-processing labs, etc...

Slide 4 All forensic offices comply to ISO 9001/2015 certification (a set of international standards for quality management)

Slide 5 Forensic genetics laboratories, in order to feed the BDN-DNA, also comply to ISO/IEC 17025 accreditation (general requirements for the competence of testing and calibration laboratories, including not only quality management, but also documentation of internal protocols, validation of calibration methods, qualification of the operators)

Slide 6-8 CSI is defined by the Italian code of Criminal Procedure as the activity aimed at searching, finding, collecting and storing all elements that can be later useful to reconstruct crime dynamics and identify the author of the crime. CSI activity includes documentation and preservation of the crime scene. CSI activity performed by the police Forensic Units is normally requested by the public prosecutor, but -in special, urgent circumstances- can be started by the police autonomously.

Slide 9 Here's a list of CSI dos and don'ts. Wear personal protective equipment (PPE) before entering the scene. Do not use the crime scene for activities not connected to investigation (eat, drink, smoke, use the toilet). Do not touch anything before it is properly photographed. Once the scene is photographed, remove objects with disposable devices (or use new gloves for each item when handled) and pack them singularly in security envelopes. Do not touch or move the body (cadaver examination is responsibility of medical personnel).

Slides 10-11 To preserve the crime scene it is necessary to evacuate from it all the non forensic (and non rescuer) persons who could be present (after registering their identities). The crime scene should be accessible only to authorized (and registered) personnel through a dedicated corridor, ending in an area immediately facing the crime scene where personnel will wear/change PPE. A wider area surrounding the crime scene should also be restricted, to prevent unauthorized access and preserve possible further evidence outside the primary crime scene.

Slides 12-16 Photographic documentation of the scene and searching of evidence should be done according to a standard procedure, typically starting from general photo documentation/observation, then focusing on particulars. Floors are inspected first, then walls and furniture, then ceiling using a right-left direction. All photos should include a ruler, to provide an indication of the size of object/stains, and alphanumeric indicator to precisely identify each object/stain.

Slide 17-19 After photo documentation and observation of visible items of interest or stains, search for invisible traces can be performed (e.g. by means of powders that can highlight the presence of fingerprints, or luminol to enhance latent blood).

Slides 20-24 As said, inspection of the cadaver is medical activity, but the police forensic unit participate to it by photo documenting the body (as if it were a piece of evidence) and the activities done on it by the medical personnel, and by contributing to preserve evidence on the cadaver itself (e.g. by placing and securing bags around the cadaver's hands in order to prevent dispersion of hair evidence that the victim may have plucked from the aggressor's scalp while fighting). Frequently,

police forces also participate to post mortem examination, since only the combination of information derived from crime scene examination (at which the forensic pathologist in charge of the post mortem seldom participates) and autopsy can often lead to a detailed reconstruction of the crime dynamics.

Slide 25 Evidence collected from the crime scene for DNA analysis should be removed interely, if possible (small objects). Sometimes, for large objects, it is possible to cut and remove the area of interest (e.g. linings). Otherwise stains can be: scraped with a disposable scalpel; swabbed; absorbed with filter paper.

Slide 26 Before being put each in a security envelop, stains must be dried. Once dried can be stored at room temperature. All stains/material difficult to dry should be transferred to the laboratory as soon as possible in portable refrigerators and then kept frozen at -20°C . Laboratory certification and accreditation procedures include a system to guarantee the chain of custody of items entering, exiting and being transferred within the lab. Freezers have a datalogger recording temperatures with an alarm system that warns operators when temperature deviate from $-15-20^{\circ}\text{C}$.

Slide 27 This is the flowchart of DNA analysis that we already know, but we have a further step down right: whenever an unknown STR profile is obtained from a crime scene sample and there's no suspect for direct comparison, it can be transferred to the BDN-DNA upon request from the public prosecutor.

Slide 28-40 briefly outline how the Italian BDN-DNA was created and how it works. Creation of the database follows subscription by Italy of the Prum Treaty (2005), aimed at the exchange of information to prevent terrorism, criminality and illegal migration in the European Union. The first positive step taken by Italy towards the adoption of the measures included in the Prum treaty came in 2009 (Law n° 85), when the general outline of the database was defined. However it took until 2016 before the BDN-DNA went operational. Law n° 85 identifies two separate entities: the BDN-DNA itself and a Central Laboratory with ISO/IEC 17025 accreditation, that is in charge to produce STR profiles from reference biological samples of different categories of individuals (subjects arrested, or detained, or under some limitation of personal freedom because suspected or condemned for major crimes, excluding some financial crimes; relatives of missing persons) that will be uploaded in the BDN-DNA. Collection of reference samples is done with buccal swabs and FTA cards: two swabs/FT cards are collected, one is immediately used (afterwards DNA is destroyed) to obtain the STR profile, that will be kept in the database for 20 years, while the second FTA card is stored for 8 years. Reference STR profile and the second FTA card are immediately removed from the database if the subject is acquitted. Reference STR profiles are crossmatched with that of evidentiary samples from the crime scene. These can be: STR profiles obtained before 2016 by any laboratory that performed investigations for judicial authorities; after April 2016, only STR profiles obtained by laboratories with ISO/IEC 17025 accreditation (police forces labs directly send their STR profiles to the BDN-DNA, while university and private labs sends data through police forces labs). Crossmatching is done by BDN-DNA personnel, that returns any match to the lab that submitted the STR profile from evidentiary samples. The BDN-DNA can also exchange data with other EU databases (in this case only reference STR profiles and evidentiary STR profiles obtained by laboratories with ISO/IEC 17025 accreditation can be compared). Evidentiary STR profiles are crossmatched with the BDN-DNA for 30-40 years upon collection, depending on the type of crime, and then removed.