

Research article

IGNA's original LIMS: A complete traceability of administrative and analytic processes for forensic cases

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Abstract

IGNA is the first French laboratory for forensic DNA analysis. IGNA LIMS was developed from the software Microsoft Dynamics NAV which is an ERP (Enterprise Resource Planning) with a real opened solution for specific development and compatible with a lot of Microsoft applications.

Thanks to the LIMS, we assure the traceability of analysis and also administrative process (traceability of letters, quotes or phone calls for each case and registration of actions to be done in a case (call for results ...)).

For one penal case, we can associate one or more sealed items. The DNA expert indicates the analysis to do on each piece (biological fluid detection, type of extraction, nuclear or mitochondrial DNA analysis ...).

During the technical process, samples automatically pass from a step to the next. Technicians indicate all the information needed for traceability (consumables lot number, used robots ...).

At the end of the process, the DNA expert validates his results, which are then directly transferred to the final report.

Development of the IGNA LIMS from Microsoft Dynamics NAV allows us to use all specific applications of an ERP such as purchases, marketing, sales, etc. and to assure computerization of all our process, from quote to analysis report.

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1. Administrative registration

A mission page is used for registering forensic cases (analysed in the laboratory). We can input all information related to the case (list and type of evidences, type of criminal offence ...) and final reports. We can assure the traceability of all letters or phone calls for each case (with interactions) and registered future actions to be done in a case.

For one penal case, we can associate one or more sealed evidences (items to be analysed). We assure the traceability of the storage location in the LIMS.

The biologist expert indicates in the LIMS the kind of analysis he/she wants to be done on each casework item (biological fluid detection, type of extraction, nuclear or mitochondrial DNA analysis ...).

2. Production set-up

This LIMS is a highly customisable software. From production set up, we define:

- the production phases (sampling, extraction, quantification ...),
- all the necessary functions for a phase, such as batch size, validation rules,
- all of the production resources needed for each step (robots, thermocyclers, sequencers ...),
- all controls needed for each step of the process (extraction controls, amplification controls ...),
- the consumables used,
- the re-analyses steps if necessary (re-extraction, rePCR ...).

When all these rules are set up, we can define a workflow (description of different steps of analysis). One or more workflows are allocated to an item to be analysed.

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3. Technical process

For reference samples, we use an automatic puncher. A file generated by the puncher is integrated into the LIMS, resulting in automatic creation of a batch.

For casework items, sampling is performed during the evidence recovery phase and samples are put into bar coded tubes. At the same moment, the technician creates in the LIMS the sample file in which all pertinent information is noted (results of blood test search, comments ...). All this information will automatically be transferred to the final report.

From the production menu, the technician can go to the general view where they can see all samples in progress. For example, on the extraction working journal, they can see all samples waiting for their DNA to be extracted.

The technician creates a batch with all the samples he has to process. On the batch file, he/she indicates all the information needed for traceability (technician name, consumables lot number, robots used ...). For each batch, samples order is printable.

From extraction to quantification each step is automatically validated.

After quantification, positive samples will also automatically pass to the amplification step. The LIMS will then calculate the dilution needed for amplification.

IGNA's laboratory is highly automated at all analytical steps. The LIMS can generate specific files needed for each robot to make manipulation (files for robots, for real time PCR engine, for sequencer). We can also import files from robots to the LIMS (for example, quantification results).

4. Technical results and validation

When all the analyses have been carried out for a particular casework, all information regarding the results obtained is available from the casework file: we can visualize all of the samples carried out on each item and the quantification results and genotypes obtained for each sample.

At the end of the technical process (analytical phase), the results obtained are integrated into the LIMS (nuclear DNA profiles from Genemapper, and mitotype profiles from Seqscape). The biologist will then validate (or not) the results which will be automatically transferred to the final report.

5. Conclusion

IGNA's LIMS developed from Microsoft Dynamics NAV is a real effective tool allowing us for computerization all our traceability, from quote to analysis report, including all the analytic steps. We can also use all specific applications of an ERP such as purchases, marketing, sales, etc.

This LIMS is a very customisable software able to evolve along with forensic methods improvements. High throughput activity in our DNA laboratory would not be feasible without all the links managed by our LIMS between clerical work, DNA production, reporting, etc.

Conflict of interest

None.