BONAPARTE DVI: SOFTWARE BASED ON BAYESIAN NETWORKS ASSISTS IN DVI AFTER THE AFRIQIYAH AIRWAYS FLIGHT 8U771 CRASH IN TRIPOLI

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On Wednesday the 12th of May 2010, Afriqiyah Airways Flight 8U771 crashed on landing near Tripoli International Airport. One child survived the crash, 70 of the 103 victims were Dutch nationals. A large number of victims were blood-relatives.

For DNA research/matching the NFI received;
- soft (muscle) and hard (bone and tooth) tissue samples from 149 bodies / body parts,
- 25 personal items (clothes, razor blades etc.) belonging to 11 missing persons,
- 195 reference samples (mostly buccal swabs) from relatives of 76 missing persons,
- 16 DNA-profiles of missing persons and/or relatives of 7 missing persons typed in foreign labs.

The samples were received between the 8th and 28th day after the crash. DNA typing was performed using the QiaAmp-kits (Qiagen) and Quantifiler-duo and Identifiler kits (ABI) to obtain DNA profiles consisting of 15 autosomal loci and amelogenin. The buccal swabs were processed by an automated robot line. DNA profiles were obtained within a period of 3-5 days after delivery of the samples.

The matching took place between days 11 and 33 after the crash, in total there where 145 DNA profiles of bodies/body parts (94 unique DNA-profiles), 15 DNA profiles of missing persons and 197 DNA profiles of relatives in 57 pedigrees containing 84 missing persons.

New software for the screening and matching of the DNA profiles was used. This software - called Bonaparte DVI - uses Bayesian networks. Bayesian networks are very well suited to model statistical relationships of genetic material of relatives in a pedigree. They can be applied in kinship analysis such that the entire pedigree of relatives of a missing person is used to compare to DNA profiles of unidentified individuals. As a result less false hits are obtained compared to methods which do not take complete pedigree information into account, but only consider one relative at a time. An additional advantage of a Bayesian network approach is that the analysis tool is transparent and flexible, allowing one to incorporate other relevant factors such as new models for mutation, size bias correction, measurement of error probabilities, missing data, more genetic markers, as well as automatic generation of customizable match reports, etc. The software performed excellently both in terms of computational performance, stability and user-friendliness. This proves that the Bonaparte DVI software is a reliable and time-saving tool which significantly simplifies and speeds up the large-scale DVI process.

The total DNA identification investigation took 26 days, 129 bodies/body parts were matched using the Bonaparte DVI software to a missing person. In total, 122 reports were written.

Further information about Bonaparte DVI can be obtained via www.dnadvi.nl