GEOGRAPHICAL RELATIONSHIP ID SYSTEM (GRIDS) FOR HUMAN IDENTIFICATION

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The Geographical Relationship ID System (GRIDS) is an innovative method for forensic identification that provides targeted investigative leads based on lineage informative Single Nucleotide Polymorphism (SNP) data when no match is found for an unknown person in existing short tandem repeat (STR) databases.

The analysis of lineage informative SNPs has lagged behind analysis of Ancestry Informative Markers (AIMs) that indicate biogeographic ancestry, and Phenotype Informative SNPs that indicate physical attributes such as hair color and eye color. Possible reasons for this are the absence of a forensic database of individuals tested on lineage informative SNPs, and the complexity of the analysis required.

Because the successful use of lineage informative SNP data for forensic identification does not require the discovery of an exact match or a match with an immediate family member, as with forensic STR-based data, a SNP database could draw on the general population, although law enforcement and military personnel would be more readily included.

GRIDS provides a means of reducing the computational requirements of processing such data. By overlaying the geographical ancestries of lineage informative SNP matches to an unknown, data processing can be reduced to only clusters of geographically proximate individuals. Such analysis can reveal genealogical connections, geographical ancestry, and a possible place of birth for the unknown, allowing a targeted investigation.

Integrating GRIDS data with graphical link analysis opens SNP matches to a larger set of relationships, networks, and datasets, providing a context for each. Kinship, social, organizational, locational, and event-based linkages can be presented visually to enhance and further focus investigative efforts. The amplified and corroborative information obtained from link analysis, as well the identification of individuals for additional SNP testing, can be critical to a successful identification. Combining these methodologies reduces the complexity of the analysis, thus saving time and investigative resources.

GRIDS, in conjunction with link analysis, can be useful for the identification of unknown assailants, unidentified remains, and victims of mass disasters where little *a priori* information is available.