

World View

Growth of ancestry DNA testing risks huge increase in paternity issues

With millions now using direct-to-consumer ancestry DNA tests, action is needed to deal responsibly with unexpected paternity issues, argues Maarten H.D. Larmuseau.

The current worldwide popularity of ancestry DNA kits stems from the universal desire to explore our family roots. This type of direct-to-consumer (DTC) test is particularly accurate in tracing biological relatedness among all participants in a company's database. Consequently, there is a possibility for each participant to acquire matches that do not conform to their legal or expected genealogy or to find a lack of matches with specific family members who already bought the ancestry DNA kit. A father may discover that his child is not biologically his and *vice versa*, or participants may unexpectedly discover that such a so-called 'misattributed paternity' (MAP) event happened within the close family. The scientifically proven chance for such an unexpected MAP event in human populations is *circa* 1% per father-child relationship (doi 10.1016/j.tree.2016.03.004). This frequency is relatively low, but we can speculate that the absolute number of MAPs uncovered by ancestry DNA tests is non-negligible and no longer a rare phenomenon in a pool of 16 million participants today. Moreover, with an expected sale of 100 million kits by 2021 (doi 10.1186/s13059-018-1506-1), the number of MAP events uncovered by DTC testing will only increase in the coming years.

Current criticism on DTC ancestry tests deals mainly with general issues i.e. the accuracy of the ethnicity analyses, the privacy and ownership of the supplied DNA profiles and their secondary use for police investigations in cold cases. Also, attention is mostly given to adopted children or children conceived through anonymous sperm or egg cell donation and their search for biological relatives. Discussions concerning these topics are important, but paternity issues receive too little attention in this debate, despite their substantial potential impact on customers' lives.

The discovery of MAPs as an 'incidental finding' (IF) is of course an already well-known phenomenon in the field of clinical genetics. However, as yet there are no professional recommendations and no standardisation exists among clinical laboratories for reporting MAPs encountered during genome sequencing to patients. Clinical geneticists and counsellors often judge that MAPs do not fall under medical IF's, because they only have social, and not medical, implications. Despite this, what limited knowledge we have concerning human MAPs in contemporary populations is a by-product of a few medical studies. A simple search on Web of Science or Google Scholar showcases a lack of knowledge on the nature of MAPs. Scientific studies specifically focussing on MAPs are few due to the taboos around paternity uncertainty and because of ethical and logistic difficulties, and possible prosecution of adultery in certain countries. Little is known of the impact on the families involved, their experiences with the disclosure or the effects on their mental health.

This clear lack of knowledge is tangible now that the public has the means to easily analyse their own DNA with direct-to-consumer genetic tests. Participants confronted with unexpected results of recreational genetic testing are limited to Facebook groups and internet forums to discuss and

exchange their personal results and experiences. The few public testimonies available describe the impact of a MAP disclosure as a Pandora's box filled with feelings of disbelief, post-traumatic stress and a strong fear of familial consequences. There is a striking general frustration at having been oblivious to this possible result when purchasing a DNA test. Participants are mainly attracted to MAP ancestry tests by the prospect of discovering an exotic genetic ethnicity or an illustrious family member. The mention of possible unexpected results is often hidden in the privacy policies and terms of use on the company's websites.

A growing number of testimonies denounce the lack of professional assistance from ancestry companies in the case of a MAP event. Being an academic researcher in genetic genealogy, I notice the lack of feedback and counselling first-hand in the plethora of mails I receive concerning this subject. People doubt the general correctness of ancestry DNA tests and ask for a professional review of their results, hoping that their fear of a MAP is unfounded. Scientific consulting proves to be valuable since it's often hard for laymen to correctly interpret the obtained results.

As things stand, families that are confronted with paternity issues uncovered by ancestry DNA tests are often left, unguided, to deal with the consequences. Specific actions by and increased responsibility of scientists, counsellors, policy makers as well as the DTC companies themselves are urgent. First, I suggest that scientific research should focus more on the occurrence and nature of MAP events, and on how confronted families are dealing with this unexpected news. Second, clear guidelines on the testing of minors are required since their participation to ancestry DNA testing is often unrestricted and the consequences for them might be highly impactful. Finally, DTC companies should provide and clearly signpost professional consulting and counselling. They should also explicitly warn participants about the potential unanticipated risks in recreational genetics.

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Competing interests

The author declares no competing interests.