Genedrive kit for detecting single nucleotide polymorphism m.1555A>G in neonates and their mothers: a systematic review and cost-effectiveness analysis

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Published October 2024
DOI: 10.3310/TGAC4201

Plain language summary

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Health Technology Assessment 2024; Vol. 28: No. 75
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NIHR Journals Library www.journalslibrary.nihr.ac.uk

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Our immune system usually fights off invading germs, such as bacteria, viruses, fungi or parasites, in order to prevent infection. Sometimes the immune system stops fighting the 'invaders' and begins to turn in on itself. This life-threatening reaction is known as sepsis. Bacterial infections and sepsis are significant causes of death and illness in newborns. Newborns with suspected bacterial infection or sepsis are normally treated with an aminoglycoside antibiotic called gentamicin (a type of medicine that is meant to kill bacteria). These antibiotics are associated with a very high risk of ototoxicity (damage to the ear, including deafness) among people with the m.1555A>G *MT-RNR1* gene variant [a specific change to the small section of deoxyribonucleic acid storing biological information] within their mitochondrial deoxyribonucleic acid (small circles of deoxyribonucleic acid located in the mitochondria, the cell's energy producer). The aim of this review was to summarise and critically evaluate existing evidence on how effective (the degree to which a test does more harm than good) and cost-effective (how effective a test is in relation to its cost) the Genedrive MT-RNR1 ID Kit is for identifying the m.1555A>G gene variant in newborns or in their mothers. We collected and analysed all relevant research studies, one moderate quality study was included in the clinical effectiveness review and no studies were included in the cost-effectiveness review. The quality of the included study was assessed as moderate for most of the outcomes (things measured to monitor the degree to which the test does more good than harm) reported due to uncertainty regarding the failure rate of the test. The results suggested that the test was capable of identifying newborns with the m.1555A>G variant. This was accomplished by successfully testing 424 out of 526 patients, with three newborns identified as carrying the gene and avoiding aminoglycoside treatment. Because of these small numbers, there does remain some uncertainty regarding the accuracy of the test. Additionally, time to antibiotic administration was not negatively impacted by the test. Similar time for treatment initiation was taken for those tested as for those not tested. This review shows that the Genedrive MT-RNR1 ID Kit has the potential to identify the m.1555A>G variant and the potential to provide value for money for the National Health Service. However, as expected, there is not enough evidence to conduct a full assessment of the clinical effectiveness and cost-effectiveness of Genedrive MT-RNR1 ID Kit in newborns directly, or their mothers. This could be addressed by generating further evidence. The risk and severity of hearing loss from aminoglycoside use is of particular interest, as is further testing of the Genedrive MT-RNR1 ID Kit in both neonates and mothers or neonates who need treatment. Such testing conducted in other settings would be of great importance.

Health Technology Assessment

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ISSN 2046-4924 (Online)

Impact factor: 3.6

A list of Journals Library editors can be found on the NIHR Journals Library website

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This article

The research reported in this issue of the journal was commissioned and funded by the Evidence Synthesis Programme on behalf of NICE as award number NIHR135636. The protocol was agreed in September 2022. The draft manuscript began editorial review in January 2023 and was accepted for publication in January 2024. The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The HTA editors and publisher have tried to ensure the accuracy of the authors' manuscript and would like to thank the reviewers for their constructive comments on the draft document. However, they do not accept liability for damages or losses arising from material published in this article.

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