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Drug Target Gene-based Analyses of Drug Repositionability in Rare and Intractable Diseases

Ryuichi Sakate[1] rsakate@nibiohn.go.jp
Tomonori Kimura[1] t-kimura@nibiohn.go.jp

[1] National Institutes of Biomedical Innovation, Health and Nutrition, 7-6-8 Saito-Asagi, Ibaraki-shi, Osaka, 567-0085, Japan

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Drug development for rare and intractable diseases has been challenging for decades due to the low prevalence and insufficient information on these diseases. Drug repositioning is increasingly being used as a promising option in drug development. We aimed to analyze the trend of drug repositioning and inter-disease drug repositionability among rare and intractable diseases. We created a list of rare and intractable diseases based on the designated diseases in Japan. Drug information extracted from clinical trial data were integrated with information of drug target genes, which represent the mechanism of drug action. We obtained 753 drugs and 551 drug target genes from 8,307 clinical trials for 189 diseases or disease groups. Trend analysis of drug sharing between a disease pair revealed that 1,676 drug repositioning events occurred in 4,401 disease pairs. A score, Rgene, was invented to investigate the proportion of drug target genes shared between a disease pair. Annual changes of Rgene corresponded to the trend of drug repositioning and predicted drug repositioning events occurring within a year or two. Drug target gene-based analyses well visualized the drug repositioning landscape. This approach facilitates drug development for rare and intractable diseases.

[1] Sakate, R.; Kimura, T. Drug target gene-based analyses of drug repositionability in rare and intractable diseases, *Scientific Reports*, **2021**, *11*, 12338.