Newborn Screening | LeXNBGS Premium Panel v1.0

Background

Newborn screening (NBS) is a targeted testing program performed during the neonatal period that seeks to detect, as early as possible, congenital and genetic disorders which pose serious threats to infant health, physical growth, and neurodevelopment but are largely amenable to treatment. By enabling prompt diagnosis and timely intervention, NBS can prevent irreversible organ damage and plays a pivotal role in reducing congenital anomalies and improving overall neonatal health outcomes.

However, conventional screening primarily relies on biochemical assays; although these methods are relatively sensitive for common metabolic disorders, they are limited by the specificity of biomarkers and the scope of screening, which can result in missed cases, false positives, and difficulty in resolving genotype-phenotype correlations. Moreover, single-target or sequential testing approaches cannot simultaneously cover the broad spectrum of rare or late-onset genetic disorders, often leading to repeated retesting and delayed definitive diagnosis. In contrast, hybrid-capture-based targeted enrichment can be flexibly designed to match the types of screening disorders and the numbers of selected genes, through parallel capture processed with NGS, enables comprehensive interrogation of predefined disease-associated gene panels, thereby facilitating more rapid diagnosis of screening diseases, improving efficiency, and expanding the types of disorders to be screened.

Introduction

LeXNBGS Premium Panel v1.0, guided by the screening principles laid out by Wilson and Jungner and informed by different countries' expert consensus and multicenter recommendations, incorporates 311 clinically significant and actionable hereditary conditions into its screening scope. The panel covers a broad scope of multisystem disorders, including metabolic disorders, endocrine disorders, hematologic disorders, neurological disorders, and immune disorders etc. By querying authoritative databases such as OMIM and GeneReviews, **LeXNBGS Premium Panel v1.0** selected 282 known disease-causing genes for inclusion. Probe design targets multiple variants including SNP, Indel and CNV etc., which spans a 1.33 Mb region of human genome, making it suitable for early screening of neonatal genetic metabolic and multisystem disorders and supporting earlier, more precise diagnosis and intervention.

To meet diverse clinical needs, LexigenBio offers three customized subpanels based on the **LeXNBGS Premium Panel v1.0**: **LeXNBGS Mini Panel** (41 disorders, 39 genes), **LeXNBGS Core Panel** (90 disorders, 83 genes), and **LeXNBGS Plus Panel** (165 disorders, 153 genes). These options enable flexible selection or personalized customization according to the intended screening scope, available resources, and local laboratory workflows.

Disorder and Gene List

Classification of Disorders	No. of Disorders	Gene
Amino acid metabolic disorder	39	*ACAD8, ACADSB, ACAT1, AHCY, AMT, ARG1, ASS1, AUH, BCKDHA, BCKDHB, CBS, CTNS, DBT, FAH, GCDH, GCH1, GLDC, HMGCL, HPD, IVD, MAT1A, MCCC1, MCCC2, MCEE, MLYCD, MTHFR, MTR, MTRR, OCRL, OTC, PAH, PCBD1, PCCA, PCCB, PTS, QDPR, SLC25A13, SLC3A1, SLC7A7, SLC7A9, TAT*
Lysosomal storage disorder	16	*ARSA, CYP27A1, GALC, GALNS, GBA, GLA, GLB1, HEXA, IDS, IDUA, NAGLU, NPC1, NPC2, SGSH, SMPD1*

(Continued)

Fatty acid metabolic disorder	16	*ACADS, CPT1A, CPT2, ETFA, ETFB, ETFDH, HADHA, HADHB, MMAA, MMAB, MMACHC, MMADHC, MMUT, SLC22A5, SLC25A20*
Carbohydrate metabolic disorder	8	*AGL, G6PC1, GAA, GALE, GALK1, GALT, PMM2, SLC37A4*
Vitamin metabolic disorder	4	*BTD, CYP27B1, HLCS, PHEX*
Minera metabolic disorder	6	*ATP7A, ATP7B, HFE, SLC12A3, VDR*
Enzymopathy	1	*PEX1*
Organic acid metabolic disorder	4	*ACADM, ACADVL, ASL, CPS1*
Lipid metabolic disorder	2	*DHCR7, LDLR*
Endocrine disorder	17	*ABCC8, CHD7, CYP11B1, CYP21A2, DUOX2, FGFR1, INS, KCNJ11, PAX8, SLC5A5, SRD5A2, TG, TPO, TSHR, WFS1*
Hematologic disorder	24	*ADAMTS13, ANK1, C3, CFH, CFI, ELANE, EPB42, F8, F9, FANCA, FANCC, FANCG, G6PC3, G6PD, HAX1, HBA1, HBA2, HBB, PKLR, PROC, PROS1, RPS19, SPTB, WAS*
Musculoskeletal disorder	11	*ALPL, COL11A2, COL1A1, COL1A2, DMD, LAMA2, LMNA, MYH7, RYR1*
Neurological disorder	24	*ABCD1, ALDH3A2, ALDH7A1, DDC, GDAP1, GJB1, MECP2, MFN2, MPZ, LeXK2, PCDH19, PMP22, SCN1A, SLC2A1, SMN1, SMN2, TSC1, TSC2*
Genitourinary disorder	12	*ABCB11, ABCB4, ATP8B1, AVPR2, CLCN5, LAMB2, NPHP1, NPHS1, PKD1, PKD2, PKHD1*
Immune disorder	22	*ADA, ATM, BTK, C3, CD40LG, CFH, CFI, CYBA, CYBB, DOCK8, IL2RG, MEFV, NCF1, NCF2, PRF1, RAG1, SH2D1A, STX11, STXBP2, UNC13D, WAS*
Sensory processing disorder	23	*CDH23, CEACAM16, CEP290, GJB2, GJB3, GPR143, MYO15A, MYO6, MYO7A, OCA2, OTOF, PAX3, PAX6, RPE65, SLC26A4, SLC45A2, SOX10, TECTA, TMC1, TYR, USH1C, USH2A*
Cardiovascular disorder	14	*ACVRL1, BMPR2, ENG, KCNE1, KCNH2, KCNQ1, LMNA, MYBPC3, MYH7, SCN5A, SCNN1A, SCNN1B*
Dermatological disease	13	*COL17A1, COL7A1, DSP, HPS1, HPS3, HPS4, HPS6, KRT14, KRT5, LAMA3, LAMB3, LAMC2, LYST*
Syndrome	9	*CEP290, COL11A1, COL2A1, COL4A3, COL4A4, COL4A5, FBN1, OFD1, SALL1*
Cancer Risk disorder	12	*APC, BMPR1A, BRCA1, BRCA2, MUTYH, NF1, NF2, RB1, SDHB, SDHD, SMAD4, WT1*
Endocrine disorder	19	*BRAF, ELN, EYA1, FGFR2, FGFR3, KRAS, NRAS, PTPN11, RAF1, SOS1, TBX1, TCOF1, VPS13B, WT1*
Respiratory disease	15	*CCDC114, CCDC39, CCDC40, CFTR, DNAAF1, DNAAF2, DNAAF3, DNAAF5, DNAH11, DNAH5, DNAI1, DNAI2, DRC1, HYDIN, LRRC6*

Performance

Basic QC Performance on Dual Platforms

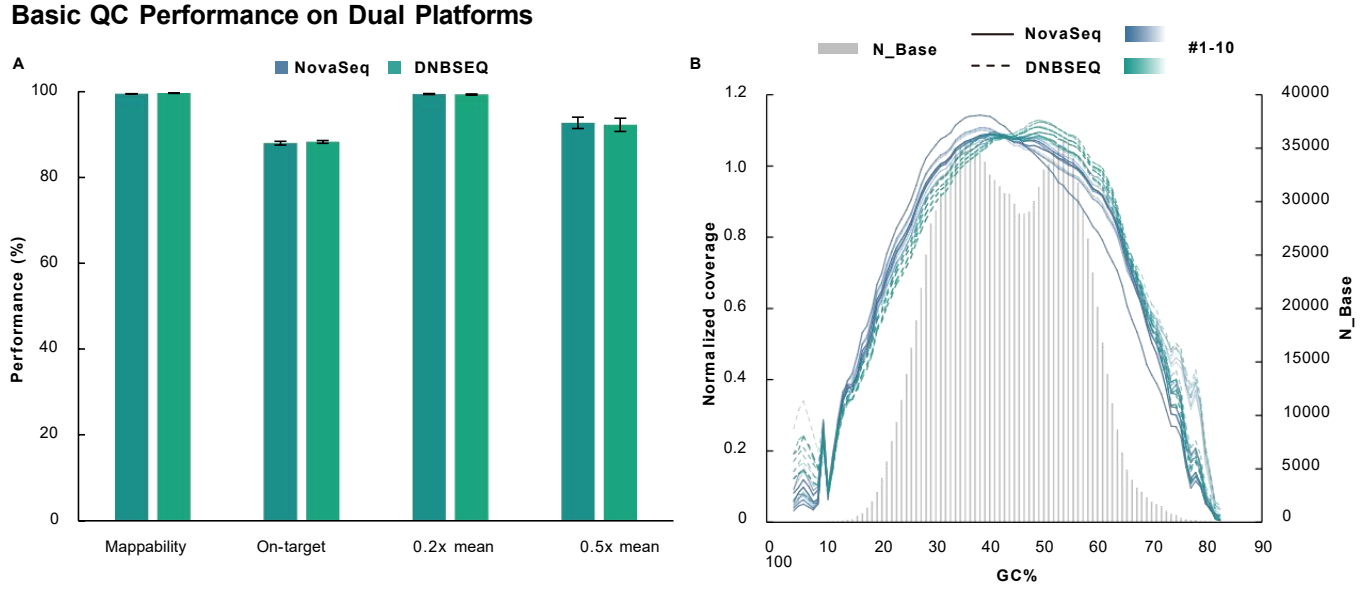

Figure 1. Basic QC performance of LeXNBGS Premium Panel v1.0 on dual platforms. A. Mappability, on-target rate, and target coverage; **B.** GC bias. Pre- libraries were prepared from 100 ng healthy human gDNA using LeXPrep EZ DNA Library Preparation Module v2 with LeXPrep Universal Stubby Adapter (UDI) Module, followed by hybrid capture using LeXNBGS Premium Panel v1.0 with LeXPrep Hybrid Capture Reagents. The BWA was used for alignment of raw reads to the reference genome and on-target rate was calculated by the number of reads. Sequencing were performed on NovaSeq 6000 (PE150) and DNBSEQ-T7 (PE150).

Multiple Variants Analysis

Table 1. Variant analysis results of DMD gDNA reference standards through targeted capture using LeXNBGS Premium Panel v1.0.

Family	Sample	Gender	Genotypes (MLPA)	Genotypes Calling	
				NovaSeq	DNBSEQ
3	HMF301	Male	Normal	Normal	Normal
	HMF302	Female	Exon48-Exon50 heterozygous deletion	1 copy (Exon48-Exon50) heterozygous deletion	1 copy (Exon48-Exon50) heterozygous deletion
	HMF303	Male	Exon48-Exon50 deletion/hemizygote	0 copy (Exon48-Exon50) hemizygote	0 copy (Exon48-Exon50) hemizygote
6	HMF601	Male	Normal	Normal	Normal
	HMF602	Female	Exon18-Exon25 haplox repeat	3 copies (Exon18-Exon25) haplox repeat	3 copies (Exon18-Exon25) haplox repeat
	HMF603	Male	Exon18-Exon25 repeat	2 copies (Exon18-Exon25) repeat	2 copies (Exon18-Exon25) repeat

Note: Samples are derived from DMD gDNA Reference Standards (GeneWell). HMF301-3 correspond to GW-HMF301-3, and HMF601-3 correspond to GW-HMF601-3; with an initial input of 50ng.

Table 2. Variant analysis results ofthalassemia gDNA reference standards through targeted capture using LeXNBGS Premium Panel v1.0.

Sample	Mutation Type (Sanger/GAP-PCR)	Observed Results			
		Allele Frequency		CNV	
		NovaSeq	DNBSEQ	NovaSeq	DNBSEQ
TGTS001	Hb Quong Sze (het)	50%	49%	NA	NA
TGTS003	-α3.7/--SEA	NA	NA	HBA1-HBA2:1	HBA1-HBA2:1
TGTS009	-α4.2/-α4.2 & IVS-II-654 (C->T) beta+ (het)	NA & 41.7%	NA & 42.7%	HBA2:0	HBA2:0
TGTS023	-50 G>A beta+ (het)	47.6%	47.2%	NA	NA

Note: Samples are derived from Thalassemia gDNA Reference Standards (GeneWell). TGTS001/03/09/23 correspond to GW-TGTS001/03/09/23; with an initial input of 50ng.

Ordering Information

Product	Scale	Catalog#
LeXNBGS Premium Panel v1.0, 16 rxn	16 rxn	LX01992
LeXNBGS Premium Panel v1.0, 96 rxn	96 rxn	LX01991

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