DEEPGEN™

QUANTGENE

DEEPGEN™ Research Solutions

DEEPGEN is a turnkey solution for anyone conducting liquid biopsy research to investigate somatic mutational patterns with next-generation sequencing (NGS). The following four facets of the DEEPGEN solution can be custom-configured to your research projects.

1) DEEPGEN Next-Generation Sequencing (NGS)

Ultra-deep sequencing allows detection of extremely rare mutational events that may be indicative of disease presence or recurrence. DEEPGEN utilizes the most advanced techniques to ensure that data output is the highest possible quality. DEEPGEN's NGS process is outlined below:

- Receive standard blood sample (10-20ml)
- Nucleic acid extraction using the Qiagen QIAsymphony and an innovative extraction technology based on industry leading chemistry that achieves high efficiencies from standard input volumes of blood
- Run DEEPGEN assay on Illumina NovaSeq 6000

The DEEPGEN panel is unique in that the assay design provides both industry leading technical sensitivity and specificity in a large pan-cancer detection custom designed panel. The assay is comprised of a target panel of 258 genes identified to be related to cancer - through a proprietary machine learning algorithm. DEEPGEN ensures industry leading analytical and clinical performance. A combination of both proprietary and consensus markers, the panel contains genes in the U.S. National Comprehensive Cancer Network (NCCN) Guidelines, lung cancer and colorectal cancer (CRC), and emerging cancer biomarkers. DEEPGEN achieves a true limit of detection of 1/1000 genome copies, better than any other available technology to date.

Technologies used: Illumina NovaSeq 6000, Qiagen QIAsymphony, DEEPGEN custom assay

Output: FastQFiles

2) DEEPGEN Mutational Detection

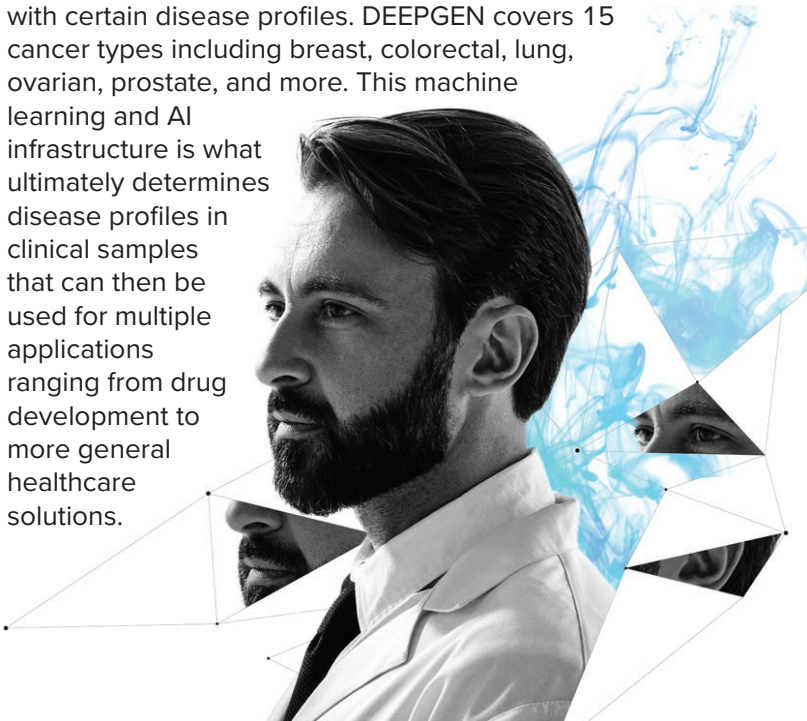
Using ultra-deep sequencing and proprietary analyses, extremely low level mutations can be detected and separated from the background noise of random mutations. Each base is evaluated to determine true pathogenic mutations from those that are non-pathogenic or due to sequencing errors.

Technologies used: DEEPGEN core engine (Deep signal processing, noise reduction, error correction, machine learning and cloud enabled bioinformatics system)

Output: Mutational Patterns

3) DEEPGEN AI Disease Recognition

DEEPGEN AI disease recognition technology utilizes both classical machine learning, and deep learning layers that have the ability to recognize relational patterns between individual features that correlate with certain disease profiles. DEEPGEN covers 15 cancer types including breast, colorectal, lung, ovarian, prostate, and more. This machine learning and AI infrastructure is what ultimately determines disease profiles in clinical samples that can then be used for multiple applications ranging from drug development to more general healthcare solutions.



Technologies used: Deep learning networks, DEEPGEN disease data sets from clinical trials

Output: Disease patterns and detection diagnostics

4) DEEPGEN Analytics

DEEPGEN analytics allows the user to understand mutational patterns by gene summaries, gene profiles including onco and tumor suppressor gene descriptions for mutations that were contained in the sample, as well as detected mutational targets that are FDA approved for guiding treatment decisions. DEEPGEN analytics also provides quality control tools that allow sample quality variables such as cfDNA input levels, plasma volumes, sequencing depth and total DNA copy counts by targets and amplicons. Additionally, easy overviews over clinical data allows for correlation between genomic and laboratory findings with clinical and demographic variables such as age, gender, ethnicity as well as comorbidities and diagnoses.

A SUPERIOR SOLUTION TO ACCELERATE YOUR RESEARCH

The current standard to develop custom-built solutions which can take years to build, are costly and have limited accuracy.

DEEPGEN is a solution to outperform any custom-built research panel. You can immediately conduct research and save more money with every single run.

1. TIME ADVANTAGE	CUSTOM BUILT	DEEPGEN
Setup Time Total		
cfDNA Extraction Optimization	3 months	Included
Assay Development	6 months	Included
NGS Refinement	3 months	Included
Bioinformatics Development	6 months	Included
TIME TOTAL	**18 MONTHS**	**1 DAY**
Setup Time Per Run		
cfDNA Extraction	4 hours	Included
Library Preparation (per batch)	8 hours	Included
NGS	4 hours	Included
Bioinformatics Analysis	30 days	Included
TIME TOTAL PER RUN	**32 DAYS**	**7-DAY TURNAROUND**

2. COST ADVANTAGE	CUSTOM BUILT	DEEPGEN
Setup Time Total		
Assay Development	$90,000	Included
NGS Refinement	$30,000	Included
Bioinformatics Development	$45,000	Included
COST TOTAL	**$165,000**	**$0 (INCLUDED)**
Cost Per Run		
cfDNA Extraction	$80	Included
Library Preparation (per batch)	$300	Included
NGS	$600	Included
Bioinformatics Analysis	$250	Included
COST TOTAL PER RUN	**$1,130**	**$950**

3. ACCURACY ADVANTAGE	CUSTOM BUILT	DEEPGEN
Setup Time Total		
Limit of Detection	Detects down to 1% MAF	Detects to 0.1% validated MAF
Genes Covered	(Variable)	258

GET IN TOUCH

For more information, please contact William Ricketts, PhD, Quantgene's Director of Clinical Affairs.

Dr. Ricketts has been in diagnostic development for more than fifteen years. He has designed, developed, and launched several CLIA cleared tests for cancer and autoimmune disease. In this role, he has written protocols and worked extensively with physicians to validate new tests and technologies for use in the clinical laboratory.

Dr. Ricketts received his BA from the University of Virginia and his PhD from the University of CA-San Diego. He is currently a Society of Gynecologic Oncology member and the American Association of Cancer Researchers.

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Appendix A

GENES TESTED WITH THE QUANTGENE DEEPGEN PANEL

ABCD1	CAMTA2	ENTPD4	HCLS1	LAS1L	NF1	RASSF2	TMEM247
ACVR2A	CAND1.11	EP300	HERC2	LATS2	NF2	RB1	TMEM63B
AKT1	CARD11	ERBB2	HIST2H2AC	LINC01410	NFE2L2	RDM1P5	TMPRSS13
ALK	CCDC57	ERBB3	HLA-A	LINC02145	NIT1	RET	TMX3
AMZ2P1	CCND1	ERCC2	HLA-DPB1	LOC100130331	NOTCH1	RGS7	TNKS1BP1
ANKRD12	CCND3	ERICH6B	HNF1A	LOC102725072	NOTCH2	RHOA	TP53
ANKRD20A9P	CD1C	ESR1	HNRNPKP3	LOC440040	NPM1	RIMS1	TP53I13
AOX3P-AOX2P	CD79B	ETV6	HRAS	LOC550113	NRAS	ROS1	TPRX1
APC	CDH1	EZH2	HRC	LOC643802	NSD2	RUNX1	TPTE
AR	CDH11	F5	HSD17B7P2	LRRC7	OBSL1	RXRA	TSPOAP1
ARHGAP5	CDH6	FAM171B	HTT	MACF1	OR4L1	SALL1	TSSC2
ARID1A	CDKN2A	FAM238A	IDH1	MAML2	OR4X2	SELPLG	TTLL5
ARL17B	CHD4	FBXW7	IDH2	MAN1B1	OSBPL9	SETDB1	U2AF1
ARMC4	COL11A1	FERD3L	IL6ST	MAP2K1	OVGP1	SF3B1	USPL1
ASXL1	COP1	FGFR3	INMT	MAP3K20	PARG	SHKBP1	UXS1
ATM	COPS3	FLT3	Intergenic	MAPK1	PCDHA1	SIRPA	VCAN
ATN1	COQ10A	FMN2	JAK2	MED12	PDXDC1	SLC29A1	VENTXP7
ATXN1	CREBBP	FMNL1	KCNMB2	MEF2A	PDXD-C2P-NPIPB14P	SMAD4	VEZF1
B2M	CRIPAK	FOXA1	KCNQ5	MET	PIK3CA	SMO	VPS45
B3GNT6	CRNKL1	FOXL2	KDM5A	MFSD11	PIK3R1	SNAPC2	XPO1
B4GALNT2	CROCCP2	FRG1BP	KDM6A	MIGA1	PIM1	SPATA31C1	XYLT2
BAGE2	CRYBG2	FRG1JP	KIAA1109	MIR1268A	PIP5K1A	SPOP	YEATS2
BAP1	CSF3R	FTX	KIAA1324L	MLLT3	PLCB4	SPTLC3	ZBTB20
BCL2	CSHL1	GAB2	KIF1A	MRPS31	PLIN4	SRGAP2-AS1	ZDHHC11B
BCL2L11	CTNNB1	GAS8	KIR2DS4	MST1	POLDIP2	STRADB	ZFPM1
BCL2L12	CYP4Z2P	GATA3	KIT	MUC4	POU6F2	STX2	ZHX3
BMS1P20	CYSLTR2	GFI1B	KLHDC7A	MUC6	PPP2R1A	SYNE2	ZRSR2
BRAF	DGKD	GNA11	KMT2A	MYD88	PRKCG	SYTL3	ZSWIM4
BRCA1	DNMT3A	GNAQ	KMT2B	MYOM1	PRMT8	TBC1D12	
BRCA2	DSCAM	GNAS	KRAS	NBPF1	PRSS3P2	TBP	
C9orf43	DUSP10	GOLGA2P11	KRTAP5-4	NBPF19	PSME4	TEKT5	
CADM2	DUSP22	GPRIN2	KRTAP5-AS1	NCOA6	PTEN	TENT5D	
CALR	EGFR	GRAMD2A	KRTAP9-1	NEB	PTPN11	TERT	
CAMK1D	EIF1AX	GRID2	LARP4B	NEFH	RAC1	TMEM131	