Cell-free DNA Analysis Solution

LiquidSCAN

geninus
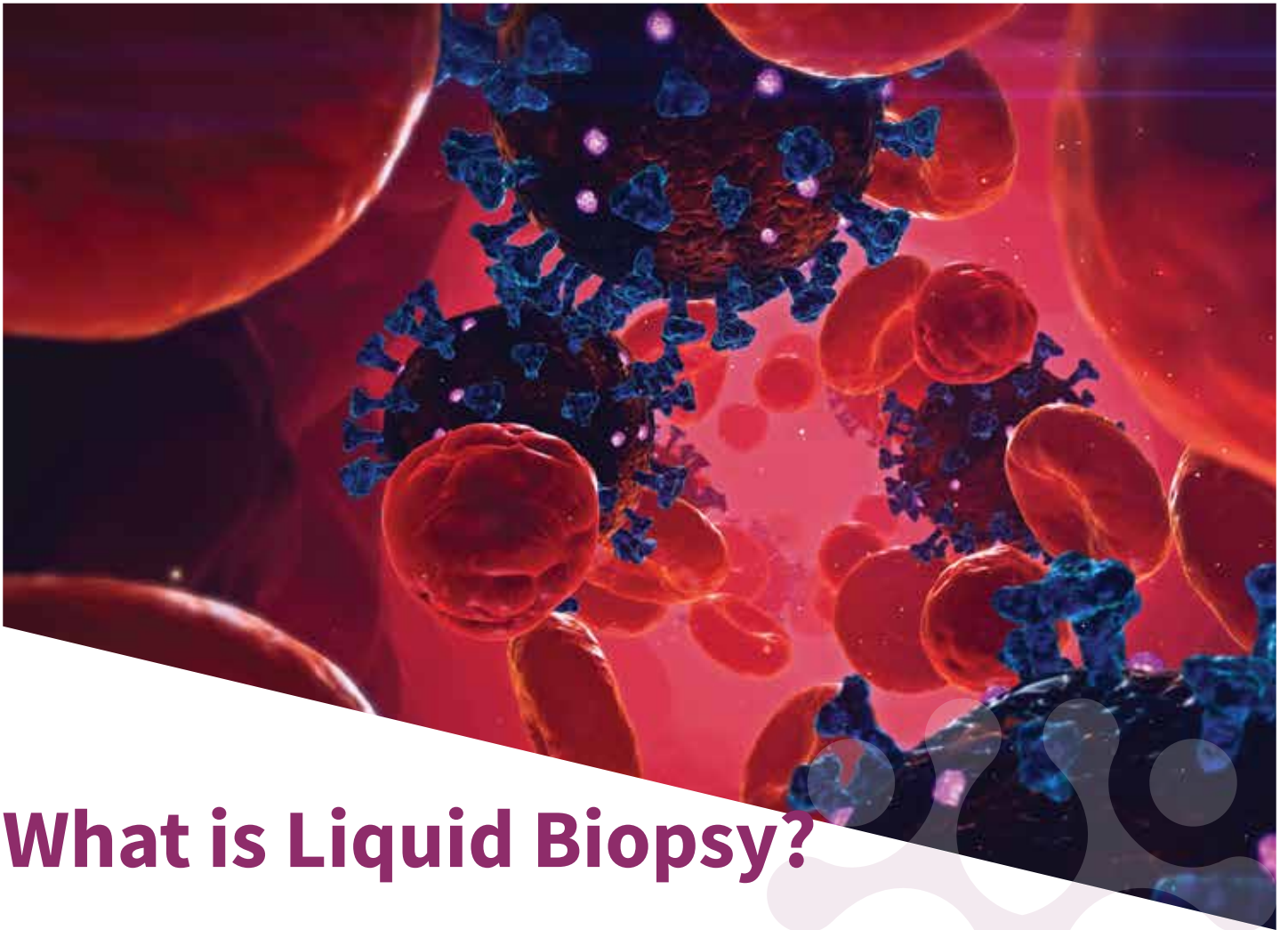
What is Liquid Biopsy?

A liquid biopsy is a simple and non-invasive alternative to tissue biopsy which enables researchers to profile genetic information of tumor by using DNA extracted from blood.
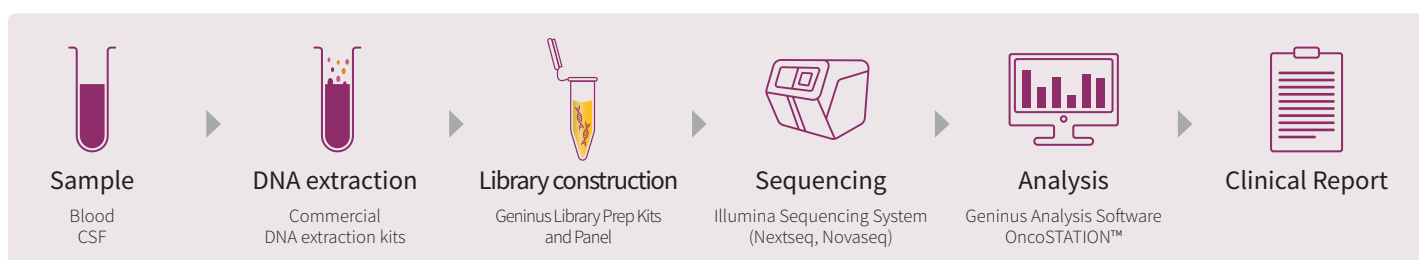
Utilizing a liquid biopsy, LiquidSCAN® analyzes circulating cell-free DNAs(cfDNAs), the degraded DNA fragments released from various cells to the blood, to detect tumor - derived DNA among cfDNAs.

Due to its non-invasive nature, it can be used for those who are unable or difficult to obtain tumor tissue for diagnosis, therapy selection, treatment monitoring, and detection of minimal residual disease and recurrence.

What is LiquidSCAN®?

LiquidSCAN® is a hybrid capture-based, next-generation sequencing(NGS) assay designed to enable researchers to interrogate genetic variants in cfDNA across cancer related genes. The assay identifies all classes of alterations including single nucleotide variants, indels, copy number alterations, and fusion at a high sensitivity and specificity, which is essential to accurate identification of ctDNA.

Workflow

Sample	DNA extraction	Library construction	Sequencing	Analysis	Clinical Report
Blood CSF	Commercial DNA extraction kits	Geninus Library Prep Kits and Panel	Illumina Sequencing System (Nextseq, Novaseq)	Geninus Analysis Software OncoSTATION™	

Streamlined analysis of cfDNA across cancer-related genes. Libraries are constructed with a proprietary assay using molecular barcodes. Illumina NGS is subsequently performed. In addition to our streamlined variant detection analysis, integration for customized analysis is also available upon request.

Types of variants detected by LiquidSCAN®

Category	Number of genes	SNV and Indels	Fusions	CNV	MSI	TMB
LiquidSCAN® Compact	44	✔	✔	✔	✔	-
LiquidSCAN® IO+	243	✔	✔	✔	✔	✔

Features and benefits

Accurate
- Molecular barcoding
- *In silico* digital error suppression algorithm
- Improved library production efficiency

Flexible
- Custom panels
- Module-based analysis service

Comprehensive
- Streamlined assistance from study design to data analysis
- OncoSTATION™ - from sample requisition to data management

Reliable
- College of American Pathologists (CAP) accreditation
- Good Manufacturing Practice (GMP) facility

Application

1. Monitoring

Unlike tissue biopsy, liquid biopsy allows to interrogate clonally divergent and distant lesions without sampling bias thus suits for longitudinal monitoring of patients during treatment. In line with this, LiquidSCAN® is utilized for treatment monitoring, drug resistance monitoring and minimal residual disease monitoring by analyzing ctDNAs at clinical level.
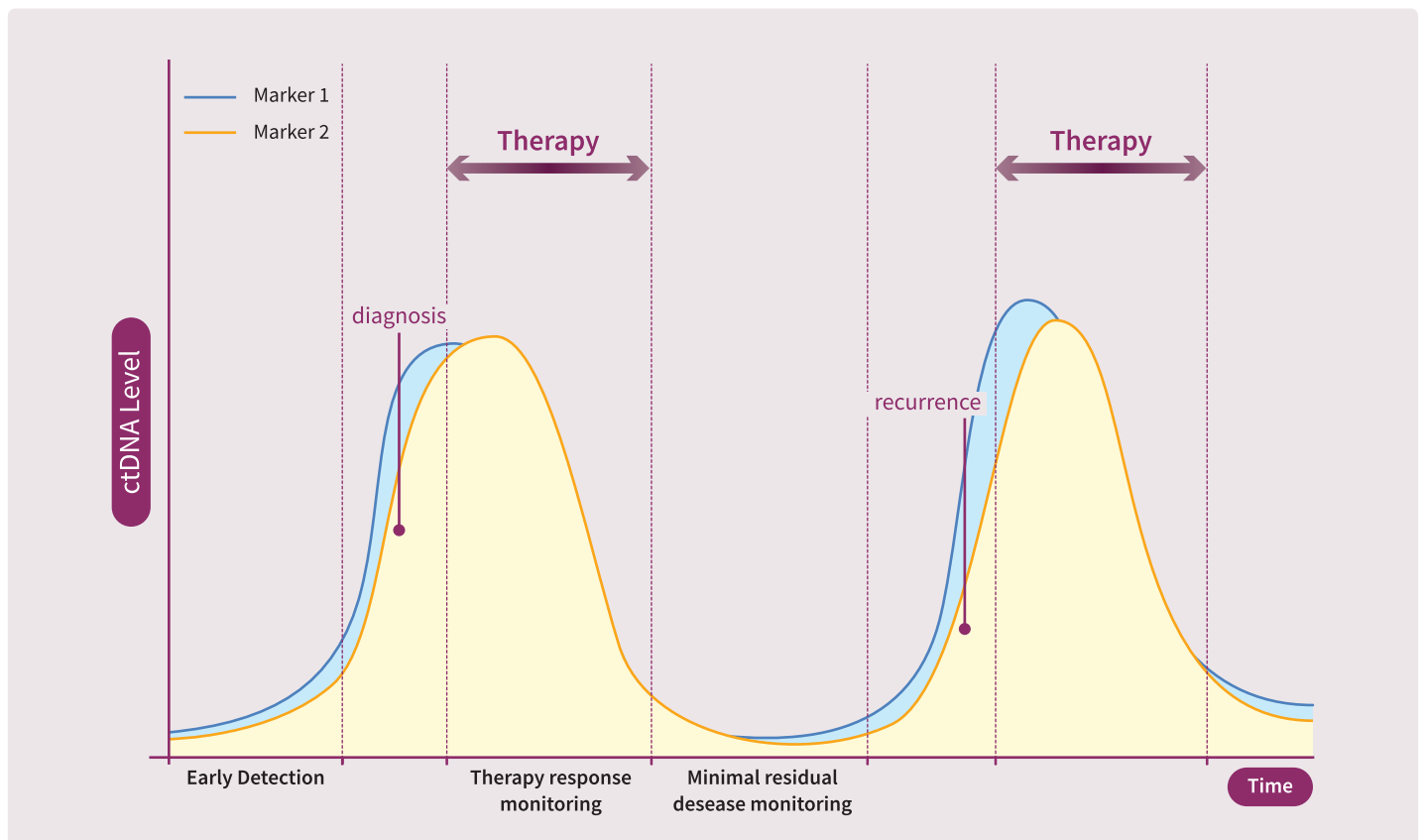
2. Therapy guidance

With Geninus proprietary analysis algorithm, LiquidSCAN® analysis report delivers actionable insights to clinicians. Variants are classified in tiers established by American College of Medical Genetics (ACMG), the targeted drug annotations according to each mutation, and clinical trial information are provided to help clinician to select the therapy to the patients.

SNV/INDEL

Variants info			cfDNA		gDNA		Supporting Info		
Tier	Gene	Alteration	VAF(%)	Dep.	VAF(%)	Dep.	Cancer Type	Drug	Sensitivity
1A	PIK3CA	C420R	13.38	2,302	0	1,828	Breast Cancer	Alpelisib + Fulvestrant	Sensitive
1B	PIK3CA	C420R	13.38	2,302	0	1,828	Breast Cancer	Buparlisib, Serabelisib, Copanlisib, Taselisib+ Fulvestrant	Sensitive

* Example only, result may differ by cases.

Strength

Improved library production efficiency

Liquid biopsies have a very limited amount of DNA, minimizing the loss between experiments is very important for data analysis. Geninus improved the library production efficiency by 2.7 times or more compared to the standard method of commercial kit by optimizing the reaction conditions of the adaptor ligation step.

x 2.7

Proprietary molecular barcoding technology

To improve data production efficiency, an independent molecular barcoding structure was developed to suppress errors caused by barcode switching that occurred in the traditional molecular barcoding. We have also developed proprietary algorithm that eliminate cfDNA specific error pattern.

Traditional Technology

Replication

Error Removal

GENINUS Technology

Replication

Modify Molecular Barcoding
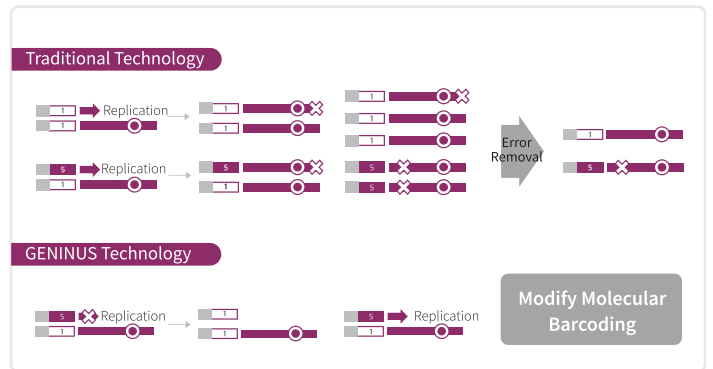
Possessing and customization of panels by cancer type

By using in-house developed database, cancer specific panel such as lymphoma, renal cell carcinoma, prostate cancer, follicular lymphoma and cancer specific noise filtering algorithm is developed.
Based on this panel development capability, we can design a unique panel that meets the needs of customers.

Clinical report : Bridging data and clinicians

- To respond to clinical needs, variants are classified in tiers established by ACMG and contents are designed by careful arrangement for actual usage and flexibility.

- From general information of patient to the drug annotations, LiquidSCAN® report reflects our duty to help clinicians make the most appropriate decision by having the confidence to leverage NGS technology.

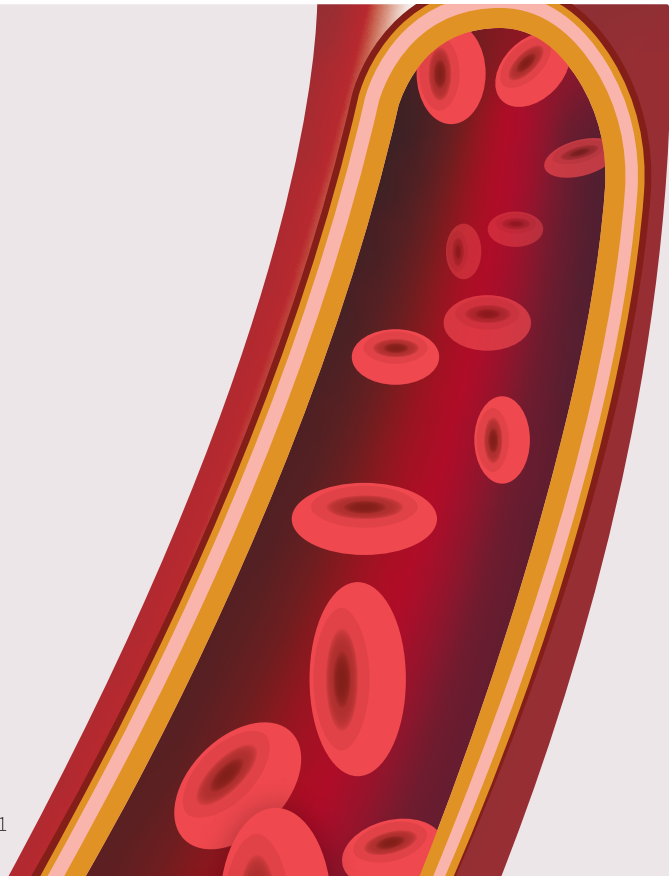# OncoSTATION™ : Beyond data, towards clinics

OncoSTATION™ is a software having its competency in supporting Laboratory information management system (LIMS), bioinformatics analysis and visualization UI provided to the customers as a package. Its automated system enables straightforward data analysis using proprietary algorithm. OncoSTATION™ provides a user-friendly environment for pathologists and clinicians by implementing it in sync with Electronic Medical Record (EMR) so that pathologists and clinicians can conveniently apply the test result to the clinical trials and share professional insights with specialists from various fields at the tumor board.

Service specification

Types of variants detected by LiquidSCAN®

Parameter		LiquidSCAN Compact		LiquidSCAN IO+	
Number of Genes		44		243	
Sequencer		Illumina NextSeq 550Dx or Illumina NextSeq 550 or Illumina NovaSeq 6000			
Total run time (Assay to report)		Fee-for-service at Geninus : 4 weeks upon recipient of sample			
		On-premise : 7 days (DNA extraction to sequencing)			
Kit size		96 samples			
Limit of detection		0.5%			
Detected variant		SNV / INDEL / FUSION / CNV		SNV / INDEL / FUSION / CNV	
		MSI		MSI / TMB	
Analytical sensitivity	Variant class	SNV	INDEL	FUSION	CNV
	Sensitivity	≥ 98%	≥ 98%	≥ 94%	≥ 100%
	VAF	≥ 0.5%	≥ 0.5%	≥ 0.5%	≥ 10%
Average NGS data output		5G		20G	
Average sequencing depth		3000x			

Multiple cancer types and the biomarkers included in LiquidSCAN IO+

Lung
ALK BRAF CDKN2A EGFR KRAS MAP2K1 NF1 NRAS PIK3CA PTEN RB1 RET RIT1 SMARCA4 STK11 TP53

Melanoma
ATM BAP1 BRAF CDKN2A MITF NRAS TERT TP53

Breast
BRCA1 BRCA2 ATM BARD1 BRIP1 CDH1 CHEK2 NF1 PALB2 PTEN TP53

Colon
PTEN APC CDH1 SMAD4 MLH1 MSH2 MSH6 PMS2 CHEK2 MUTYH POLD1 POLE STK11

Gastric
CDH1 MLH1 MSH2 MSH6 PMS2 SMAD4

Pancreas
BRCA1 BRCA2 CDKN2A TP53 MLH1 ATM

Sarcoma
TP53 RB1 CDKN2A ATRX CDKN2B EWSR1 NF1 PTEN MDM2 KMT2D TERT BRCA2 ARID1B BCOR KDR PIK3CA CDK4 NTRK1 NOTCH1 MYC ARID1A NRAS IGF1R DICER1 MET MAP2K4

Liver
TP53 CTNNB1 SMAD2 SMAD4 RB1 CDKN2A CCND1 IDH1 KRAS ARID1A FGFR2 BAP1 CDKN2B KMT2D ATM PIK3CA BRAF

Bladder
ARID1A ATM CDKN2A CREBBP FGFR3 HRAS KDM6A KMT2D PIK3CA PTEN RAF1 RB1 TP53

Myeloid
KIT FLT3 NPM1 CEBPA RAS WT1 BAALC ERG MN1 DNMT TET2 IDH ASXL1 PTPN11 CBL

Ovarian
AKT1 BRCA1 BRCA2 CDH1 CTNNB1 MLH1 MSH2 MSH6 PIK3CA PMS2 STK11 TP53

*Representative biomarkers for each cancer type are listed.

Service order process

1)) Select service

	Service	Cancer Type	Number of Genes
1	LiquidSCAN Compact	Pan-cancer	44
2	LiquidSCAN IO+	Pan-cancer	243
3	LiquidSCAN Prostate	Prostate	59
4	LiquidSCAN Lymphoma	Lymphoma	54
5	LiquidSCAN RCC	Renal cell carcinoma	51
6	LiquidSCAN Follicular Lymphoma	Lymphoma	58

* Lists of genes for each panel are attached in the Appendix.

2) Sample preparation
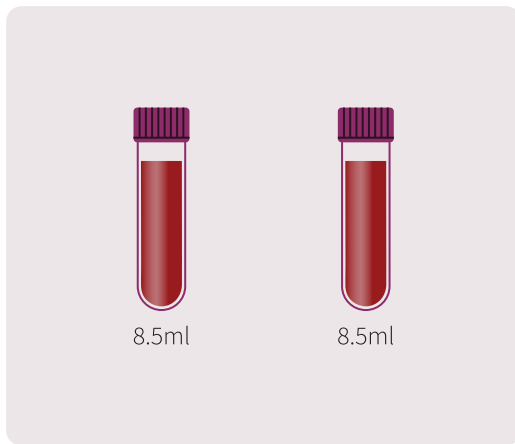
Blood
- Two tubes of whole blood (8.5-10ml) are recommended.
  (In total, 17~20ml of whole blood are recommended)

- If blood samples are collected in
  1) EDTA tubes, plasma samples are needed to be isolated within 6h of collection.
  2) Cell-Free DNA™ tubes(Streck inc., Omaha, NE, USA) ships to Geninus in a room temperature storage condition within 2 days (maximum 7 days) after sample collection.

8.5ml   8.5ml

Plasma / buffy coat
- Two tubes of platelet-free plasma(3-5ml per tube) are required
- For matched-normal analysis, one tube of buffy coat samples isolated is required.

3-5ml   3-5ml
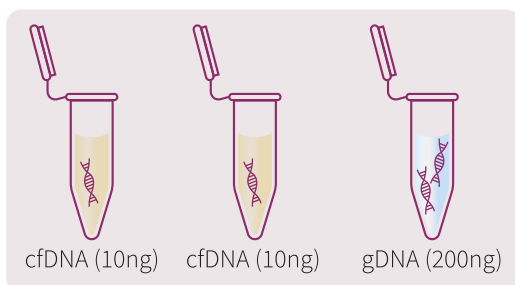
DNA extracted from plasma and buffy coat
- Two tubes of 20ng(at least 10ng) cfDNA are desired.
- At least 200ng genomic DNA is required.

cfDNA (10ng)   cfDNA (10ng)   gDNA (200ng)

3) Shipping

- Cell-Free DNA™ tube : Pack in sealed box and ship at room temperature
- Plasma, buffy coat, DNA : Pack with dry ice in Styrofoam box
- 📍 5F, KDU Tower, 70, Jeongui-ro, Songpa-gu, Seoul, 05836, Republic of Korea (서울시 송파구 정의로 70(문정동) KDU타워 5층)
- ☎ 02-6949-6570

Panel and reagent order process

Panel and library preparation kits are available for on-premise analysis.

1) Select panels and reagent

Product			No. of reactions
LiquidSCAN®	Customized panel	Customized probe	96
	Library prep kit	EA buffer, enzyme	
		Ligase buffer, enzyme	
		Primer	
		UMI index	
		Blocker solution	
		Binding buffer	
		Wash buffer	
		Purification beads	

Customized panel and library prep kit can be purchased separately.

2) Analysis software

Analysis software will be setup with OncoSTATION™.
Please contact sales representative for software license.

Contact us

www. kr-geninus.com

☎ 02-6949-6570   Fax. 02-6949-6580

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