# Whole Genome Amplification

### Whole Genome Amplification Product Listing

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The GenomePlex® WGA family of products are derived from the proprietary amplification method that is based upon random fragmentation of the genome into a series of overlapping, short templates. The resulting shorter DNA strands are efficiently primed and amplified to generate a library of DNA fragments with defined 3' and 5' termini, the OmniPlex® library. This library is replicated using a linear, isothermal amplification in the initial stages, followed by a limited round of geometric (PCR) amplifications.

WGA has been used in a variety of applications and is suitable for use with purified genomic DNA from a variety of sources including: blood cards, whole blood, buccal swabs, soil, plant and formalin-fixed paraffin-embedded (FFPE) tissues. GenomePlex WGA uses nanogram quantities of starting genomic DNA, which after PCR yields 10 μg of WGA product. After purification, the WGA product can be analyzed in a manner similar to any genomic or chromosomal DNA sample. A number of downstream applications may be performed including TagMan® assays, CGH analysis, SNP analysis, sequencing, etc.

## GenomePlex® Whole Genome **Amplification Kit**

The GenomePlex Whole Genome Amplification Kit (WGA1), contains all the necessary reagents to perform fragmentation and library preparation and allows the customer the flexibility of using their amplification enzyme of choice.

#### **Features and Benefits**

- Choose from a variety of DNA sources: whole blood, buccal swab, blood card, plant, soil and formalin-fixed paraffin-embedded (FFPE) tissue
- Enjoy the compatibility GenomePlex provides with many downstream applications: TagMan assays, SNP analysis, sequencing or store at -20 °C for future use
- See a complete representation of the entire genome with no detectable allele bias

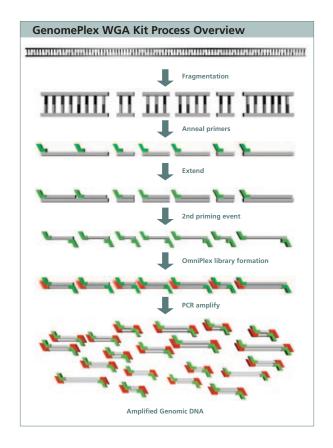
Components: 10× Fragmentation Buffer

1× Library Preparation Buffer Library Stabilization Solution Library Preparation Enzyme 10× Amplification Master Mix Nuclease-Free Water Control Human Genomic DNA

Storage: -20 °C Shipped in wet ice

#### **Ordering Information**

Cat. No.	Product Description	Quantity
WGA1	GenomePlex Whole Genome Amplification (WGA) Kit	50 reactions



# **GenomePlex® Complete Whole Genome Amplification Kit**

The GenomePlex Complete Whole Genome Amplification Kit (WGA2) contains everything required for whole genome amplification including an optimized enzyme, WGA DNA Polymerase. The WGA DNA Polymerase provides increased accuracy in amplification, as evidenced by producing no amplicon in the negative control reactions. WGA has been used in a variety of applications, and is suitable for use with purified genomic DNA from a variety of sources including blood cards, whole blood, buccal swabs, soil, plant, and serum. GenomePlex WGA uses nanogram quantities of starting genomic DNA, which after PCR yields on average 10 µg of amplified DNA. After purification, the WGA product can be analyzed in a manner similar to any genomic or chromosomal DNA sample. A number of downstream applications may be performed including TagMan® assays, CGH analysis, SNP analysis and sequencing.

#### **Features and Benefits**

- Increase amplification accuracy with WGA DNA Polymerase
- See a complete representation of the entire genome with no detectable allele bias
- Choose from a variety of DNA sources: whole blood, buccal swab, blood card, plant, soil, and formalin-fixed paraffin-embedded (FFPE) tissue
- Enjoy the compatibility GenomePlex provides with many downstream applications: TaqMan® assays, SNP analysis, CGH analysis, or store at -20 °C for future use

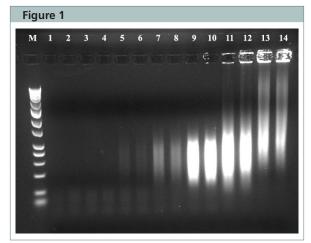
**Components:** WGA DNA Polymerase

10× Fragmentation Buffer
1× Library Preparation Buffer
Library Stabilization Solution
Library Preparation Enzyme
10× Amplification Master Mix
Nuclease-Free Water
Control Human Genomic DNA

**Storage:** –20 °C Shipped in wet ice

#### **Ordering Information**

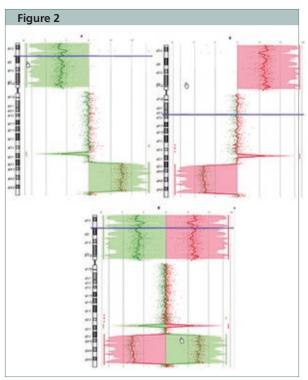
Cat. No.	Product Description	Quantity
WGA2	GenomePlex Complete Whole	10 reactions
	Genome Amplification Kit	50 reactions



**Figure 1.** WGA was performed on increasing concentrations of human genomic DNA. Amplification product can be detected on an agarose gel with as little as 10 pg of input DNA. Optimal performance is found with 1 to 10 ng of starting material. Increasing the amount of input DNA to 100 ng is not recommended.

Lane M: DNA Marker Lanes 1,2: no template Lanes Lanes 3,4: 1 pg DNA Lane Lanes 5,6: 10 pg DNA Lanes

Lanes 7,8: 100 pg DNA Lanes 9,10: 1 ng DNA Lanes 11,12: 10 ng DNA Lanes 13,14: 100 ng DNA



**Figure 2.** GenomePlex WGA was performed on genomic DNA isolated from HT29 colon carcinoma cells and from a healthy human male. 2.5  $\mu g$  of WGA product was labeled with Cy3® or Cy5 dye using the Genomic DNA Labeling Kit PLUS (Agilent). The entire labeled sample was loaded onto an Agilent Human Genome CGH Microarray 105A. Specific activities were between 28 and 43 for all samples, and always within 50% of samples being compared. The dye swaps (A & B) demonstrate that there was no bias in the DNA labeling and the aberrations detected are consistent with the HT-29 karyotype.

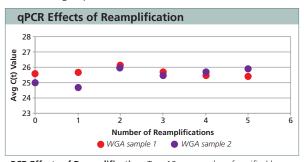
# Whole Genome Amplification

## GenomePlex® WGA **Reamplification Kit**

The GenomePlex WGA Reamplification Kit (WGA3) allows subsequent reamplifications of the initial WGA product. The successive reamplification provides DNA with minimal genetic bias when compared to the original genome. The reamplification kit contains the WGA DNA Polymerase and the 10× Master Amplification Mix.

#### **Features and Benefits**

- Maintain representation of the entire genome through subsequent reamplifications
- Preserve precious source material by amplifying nanogram amounts of starting genomic DNA into microgram yields (on average up to 500-fold) in less than three hours



qPCR Effects of Reamplification. Two 10 ng samples of purified human genomic DNA were amplified with WGA2. Each WGA product was then reamplified five successive times with WGA3. qPCR was performed on each sample using primer pairs representative of eight different single copy loci and the average C(t) was determined. Genomic representation was maintained after five successive reamplifications

**Components:** WGA DNA Polymerase 10× Amplification Master Mix

Storage: -20 °C Shipped in wet ice

#### References

- 1. Barker, D.L., et al., Two methods of whole-genome amplification enable accurate genotyping across a 2320-SNP linkage panel. Genome Res., 14, 901-907 (2004).
- 2. Gribble, S., et al., Chromosome paints from single copies of chromosomes. Chromosome Res., 12, 143-151 (2004).
- 3. Thorstenson, Y.R., et al., An Automated Hydrodynamic Process for Controlled, Unbiased DNA Shearing. Genome Res., 8, 848-855 (1998).

#### **Ordering Information**

Cat. No.	Product Description	Quantity
WGA3	GenomePlex WGA Reamplification Kit	50 reactions

## Whole Genome **Amplification Advisor**

#### The comprehensive Whole Genome **Amplification technical resource**

The WGA Advisor: Tools and Protocols for Success, your guide to understanding whole genome amplification techniques and maximizing results!

#### **Features and Benefits**

- Whole Genome Amplification Methodologies
- Optimized DNA Extraction Protocols
- GenomePlex WGA Tools and Protocols
- FAQs and Troubleshooting strategies
- GenomePlex Automation Resources



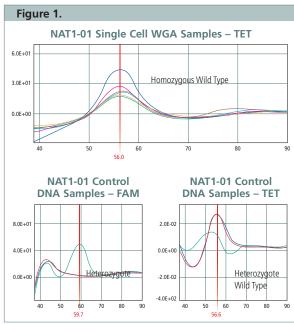
Download the Whole Genome Amplification Advisor Today! sigma.com/wgaadvisor

# GenomePlex® Single Cell Whole Genome Amplification Kit

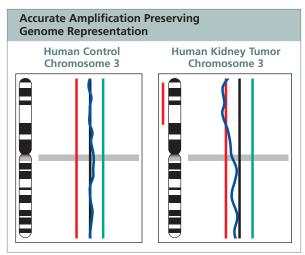
The GenomePlex Single Cell Whole Genome Amplification Kit (WGA4) is designed to amplify the genome of a single cell. This rapid and straightforward method provides millionfold amplification yielding microgram quantities of genomic DNA from a single cell. Traditional single cell whole genome amplification methods yield insufficient quantities with significantly biased representation. However, the GenomePlex technology provides enhanced amplification efficiency with WGA DNA Polymerase. The Single Cell WGA Kit includes all of the reagents necessary for cell lysis and subsequent whole genome amplification. Single cells can be isolated by fluorescence-activated cell sorting (FACS), laser capture microdisection (LCM), dilution or any other applicable method.

#### **Features and Benefits**

- Robust and accurate amplification abundant DNA yield within four hours
- Maximum flexibility amplify DNA from any source including lymphocytes, cancer cells, epithelial cells, fibroblast amniotic cells, polycarbonate fixed cells and plant cells
- Unlimited genetic analysis GenomePlex Single Cell WGA DNA is suitable for use with downstream applications including gel electrophoresis, qPCR, CGH microarray, STR analysis and SNP analysis



**Figure 1.** U937 Leukemia Single Cells were amplified using the GenomePlex Single Cell WGA procedure. Ten nanograms of amplified DNA was then utilized in a MGB Eclipse SNP quantitative PCR reaction on the ABI 7700. Dissociation curves allow allele determination based upon the melting temperature (Tm). FAM and TET fluorescent signals distinguish homozygous wild and heterozygous mutant types. The WGA amplified single cell DNA was tested for the NAT1-01 SNP as well as MTHFR01 and IGF1R-03 (data not shown). Unamplified control DNA was evaluated with each group to serve as a positive control. The data indicates that all amplified single cells were the same allele for each SNP tested and were therefore unchanged by WGA .



**Figure 2.** DNA from normal and tumorigenic human kidney cells were amplified using the GenomePlex Single Cell WGA Kit. Amplified material was hybridized to metaphase BAC arrays to determine chromosomal karyotype. Data that falls outside of the red line indicates chromosomal loss, while data that continues past the green line suggests chromosomal amplification. As expected the control sample demonstrated a balanced chromosomal copy number. Chromosome 3 for the amplified kidney tumor single cell displayed under representation as depicted by the red bar. These results match previous microarray work using an amplification method that took three days. GenomePlex technology accurately amplifies genomic material down to single cell resolution.

Data is courtesy of Dr. Michael Speicher from Institute Human Genetics, TU Munich.

Components: 10× Single Cell Lysis and Fragmentation Buffer Proteinase K Solution
1× Single Cell Library Preparation Buffer Library Stabilization Solution
Library Preparation Enzyme
10× Amplification Master Mix
WGA DNA Polymerase
Control DNA (5 ng/μl)

**Storage:** –20 °C Shipped in wet ice

Nuclease-Free Water

#### **Ordering Information**

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Cat. No.	Product Description	Quantity
WGA4	GenomePlex Single Cell	10 reactions
	MGΔ Kit	50 reactions

# Whole Genome Amplification

### GenomePlex® Tissue Whole **Genome Amplification Kit**

The GenomePlex Tissue Whole Genome Amplification Kit (WGA5) contains all of the reagents necessary to amplify genomic DNA directly from formalin-fixed, paraffin-embedded (FFPE), frozen, RNA/ater<sup>™</sup>-preserved or fresh tissue. The kit includes optimized reagents for tissue disruption and cell lysis eliminating the need for tedious organic extractions to remove excess paraffin or DNA purification prior to amplification. This rapid and straightforward method yields microgram quantities of genomic DNA from one milligram of tissue.

#### **Features and Benefits**

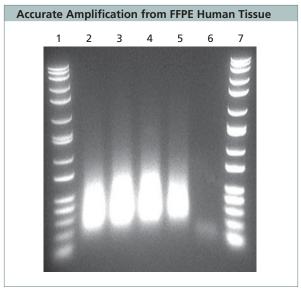
- Streamlined protocol optimized lysis protocol eliminates the need for tedious organic extractions to remove excess paraffin when working with FFPE, or DNA purification from any tissue type.
- Robust and accurate amplification abundant DNA yield in around 4 hours with no detectable allele or locus bias
- Unlimited genetic analysis GenomePlex Tissue WGA DNA is suitable for use with downstream applications including gel electrophoresis, qPCR, CGH microarray, STR analysis and SNP analysis.

Components: 10× Single Cell Lysis and Fragmentation Buffer CelLytic Y Solution Proteinase K Solution Library Stabilization Solution Library Preparation Enzyme 10× Amplification Master Mix WGA DNA Polymerase Control DNA (5 ng/µl) Nuclease-Free Water

Storage: -20 °C Shipped in wet ice

#### **Ordering Information**

Cat. N	No.	Product Description	Quantity
WGA	5	GenomePlex Tissue WGA Kit	50 reactions



Accurate amplification from FFPE human tissue. DNA was amplified directly from 1 mg of various formalin-fixed, paraffin embedded human tissues with the GenomePlex Tissue WGA Kit (WGA5). DNA was purified with the GenElute PCR Clean-up Kit and analyzed on a 1% Agarose Gel. WGA yields were 5-6 micrograms for all samples.

Lane 1: Wide Range Marker Lane 2: Uterus sample 1

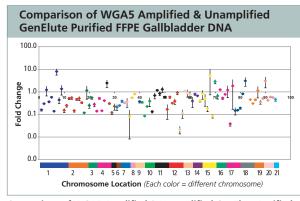
Lane 3: Uterus sample 2

Lane 4: Gall Bladder

Lane 5: Colon

Lane 6: No Template control

Lane 7: Wide Range Marker



Comparison of WGA5 Amplified & Unamplified GenElute Purified FFPE Gallbladder DNA. Real-time qPCR was performed targeting 96 loci on unamplified human genomic DNA isolated directly from formalin-fixed paraffin embedded (FFPE) gallbladder tissue or DNA products generated with the GenomePlex® Tissue Whole Genome Amplification Kit starting with 1 mg of the same FFPE gallbladder tissue. Fold change was calculated as 2<sup>CT</sup>, where CT is the average CT value generated from GenomePlex amplified DNA minus the average CT value generated from unamplified DNA.