

Extraction solutions from LGC

LGC is unique in the extractions marketplace in that we are both a service provider and a developer of proprietary chemistries and instrumentation for nucleic acid extraction.

To provide the most efficient and effective extraction method, we offer not only a range of different extraction technologies but also the capability to develop tailor-made kit systems for all applications and downstream requirements.

Our range of technologies allows delivery of optimised extractions from an unrivalled array of matrices including:

- A variety of plant material (including leaves and seeds)
- Blood
- Animal tissue / hair samples
- Forensic samples
- Saliva
- Buccal swabs
- PCR- / Seq clean-up
- Bacteria and other prokaryotes as well as plasmid preparations.

To complement our extraction kits and instruments, we also offer nucleic acid extraction services.

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Extraction technology: an overview

Our range of proprietary and tailor-made kits for nucleic acid extraction enables the extraction of DNA for virtually any application. Our technology solutions include the patented sbeadex™ technology

(surface-coated superparamagnetic beads) alongside our Kleargene™ (spin columns) products.

www.lgcgenomics.com/nucleic-acid-extraction/kits

Kit features	sbeadex ⁽¹⁾	Kleargene spin
Mechanism of action	Surface-modified superparamagnetic particles Novel two-step binding mechanism	Glass fibre solid support inserted into a microtitre plate
Optimised matrices	Plant tissue, animal tissue and cells, plasmids, forensic samples	Plant leaf and seed tissue
Automation potential	Full automation possible	Semi-automation possible
Instruments	oKtopure™	Genespin™
Scalability	Customised kits adapted in 96-well format	96-well format; 384-well format;
Options for customisation	Adaptation to any sample material	Adaptation of buffer composition
Key features	No organic solvents or chaotrophic salts in final wash buffer No drying of beads for evaporation of alcohols High flexibility of all extraction parameters High DNA yields	Suitable for manual or semi-automated extraction solutions 96- or 384-well format

⁽¹⁾ Our surface-coated superparamagnetic particles do not require the use of vacuum filtration or centrifugation steps, hence they are well-suited to automation.



sbeadex kits

The sbeadex kits use surface-modified superparamagnetic particles that bind nucleic acids via a novel two-step binding mechanism.

Nucleic acids affix to the sbeadex surface chemistry via polar interactions during the first binding step (see schematic, Bind 1 shown as “x”) and via an affinity-driven mediator during the second binding step (see schematic, Bind 2 shown as “y”).

The sbeadex two-step binding mechanism means that higher purity nucleic acids can be extracted from sample material as the switch between binding mechanisms allows more impurities to be removed during the extraction process.

The advantages of sbeadex

- High-quality DNA produced, suitable for all genomics applications including next-generation sequencing
- Suitable for most popular robotic platforms (including oKtopure)
- Lysis conditions and other extraction specifications can be tailored to customer requirements
- Extraction speed optimisation - quicker results
- High flexibility in batch sizes and kit volumes
- No organic solvents in final wash buffer results in high purity
- No salts in eluates (high OD_{260} / OD_{230}).

Lyse*

Bind 1

Wash 1

Bind 2

Wash 2

Elute



Automation solution on oKtopure - total time: 8 plates in 1 - 2 hours

*Debris removal / sample enrichment might be required for lysis.

The oKtopure

Fully automated nucleic acid extraction with sbeadex



Plant breeders are utilising the rapid and continued advancement of molecular biology-based technologies to dramatically accelerate their breeding programs. The oKtopure platform has been developed to deliver automated DNA extraction from **8 x 96-well microtitre plates in parallel**, utilising the proprietary sbeadex magnetic bead-based chemistry.

The instrument delivers standardised, high-throughput extractions and results in purification of high quality **DNA suitable for all downstream applications** including sequencing (NGS, Sanger) and SNP genotyping, for example with our KASP chemistry.

The platform is equipped with a 96-tip head and 8 magnetic devices that can be positioned to fix the beads in the bottom of the microtitre plates during buffer transfer steps.

Why choose the oKtopure platform?

1. Enables efficiency, higher throughput and full automation of sbeadex based extractions
 - 8 x 96-well plates / 1 - 1.5 hour for sbeadex mini extractions (20-30 mg starting material)
 - 8 x 96-well plates / 2.5 hours for sbeadex maxi extractions (80-100 mg starting material)
2. Offline tip washing option drives reduced consumable costs through reuse of tips
 - Cost savings of up to 50%
3. Compatible with existing SNPLine installations
4. Customised or preset protocols to suit a wide variety of sample materials.

Kleargene spin plate kits

The Kleargene spin plates utilise a glass fibre solid support to extract DNA using polar interactions. Contaminants including proteins and sugars are efficiently removed by using chaotropic salt-based buffers and ethanol.

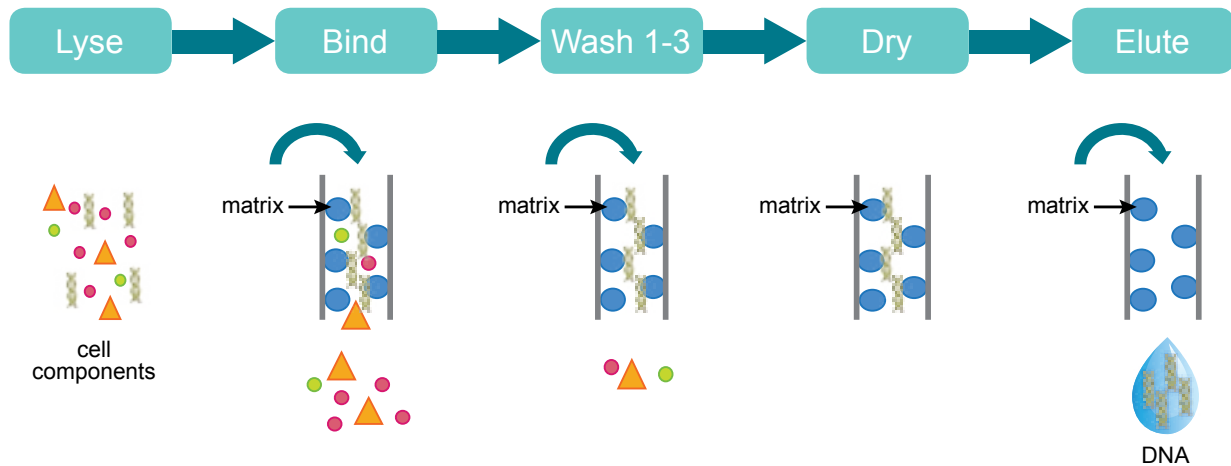
Kleargene spin plate kits can produce yields between 100 ng and 10 µg DNA from samples such as plant leaf tissue, plant seeds and rodent tails.

Spin plates can be used for manual as well as semi-automated DNA extractions, starting with up to six leaf punches.

The Kleargene kit is available in both a 96-well format (plant and tissue kit) and a 384-well format (plant kit only), achieving much higher throughput than comparable extraction technologies.

The advantages of Kleargene

- High-throughput DNA extractions
 - 96-well format
 - 384-well format
- Semi-automated setting (Genespin)
- Manual high-throughput extractions (centrifuge required)
- High yield of quality DNA
- Broad range of sample types
 - plant leaves
 - seeds
 - tissue
- DNA quality suitable for all PCR-based applications.



Automation solution on Genespin - total time: 1 plate in ~1 hour; up to 96 plates in 4 hours

The Genespin

High-throughput extractions with Kleargene



Speed is of the essence when analysing DNA for plant breeding populations; whole generations must be analysed for the presence or absence of desired biomarkers in time to enable the correct plants to be used in the next generation of breeding. This creates a demand for high-throughput DNA extraction from plant tissues, with resultant purified DNA of a suitable quality for PCR-based applications.

The Genespin platform has been developed to deliver semi-automated DNA extractions in 96- or 384-well formats. The Genespin is optimised to work with our proprietary Kleargene chemistry, and offers some additional options for DNA stamping and dilution plate preparation.

The instrument provides standardised, semi-automated high-throughput DNA extractions for downstream PCR-based applications.

Why choose the Genespin platform?

1. **Enables highest throughput: 8 x 96 plates / hour**
 - 96-well spin plates: up to 5,500 samples per day
 - 384-well spin plates: up to 20,000 samples per day
2. **Minimise consumable costs: in-built tip wash station ensures that only one set of tips is required per run**
3. **The Genespin instrument can be used to prepare DNA dilution plates**
 - (96-well) and to stamp DNA into PCR plates
4. **Efficient use of laboratory space**
 - Small footprint:
170 cm x 68.5 cm x 65 cm
5. **Compatible with SNPLine installations.**

Automation solutions: an overview

We have a solution to meet your needs based upon your sample requirements, throughput capabilities, the quality of

extracted DNA and the possible grades of automation, both robotic platforms offer significant benefits to our customers.

The table below provides a comparison of our two extraction automation instruments and their specific benefits.

Kit features	oKtopure	Genespin
Grade of automation	Fully automated	Semi automated
Throughput	Up to 3,500 samples / day	up to 20,000 samples / day
Chemistry	sbeadex (magnetic)	Kleargene (spin plates; columns)
IFormat	96-well	96- and 384-well
Applications	Leaf and seed tissue, animal tissue, hair	Leaf and seed tissue, rodent tails
Downstream applications	All genomics-based technologies	PCR-based technologies
Replicator functions	96-well only	Other formats possible: 96- and 384-well
Size (cm)	170 x 68.5 x 65	170 x 68.5 x 65
Laboratory requirements	Air pressure	Centrifuge with plate adaptors

Highlight of available kits

Kit	Application areas	Amount of starting material	Expected yield ⁽¹⁾	Number of SNPs that can be genotyped
sbeadex mini plant	plant leaves and seeds	30 - 60 mg	2 µg	up to 500
sbeadex maxi plant		80 - 100 mg	10 µg	> 1000
Customised sbeadex kit		on demand	on demand	on demand
sbeadex forensic	hair	5 -50 hair	> 200 ng	> 100 SNPs
sbeadex tissue	tissue	20 mg	2 - 10 µg	> 1000
Kleargene spin 96-well plates	plant and animal tissue	≥ 6 leaf punches	5 µg	> 1000
Kleargene spin 384-well plates		2 - 3 leaf punches	1.5 µg	< 300

⁽¹⁾ DNA yield is highly dependent on the species, sample quality, and sample quantity. The numbers given as based on the maximum capacity of the DNA-binding surface.

Extraction services

Our range of genomics services includes optimised high-quality DNA and RNA extraction solutions. Depending on project size, biological background of the project and downstream processing requirements, we can implement an extraction solution customised to a particular application using any combination of our proven technologies.

Nucleic acid extraction services include:

- Extraction of genomic DNA
- Quantification by UV measurement and / or PicoGreen®
- Concentration normalisation of extracts
- Quality check with SNP analysis
- Gel electrophoresis analysis (0.8% standard agarose gel)
- Extraction from any sample type including frozen sample material
- An option to store extracted DNA.



RNA extraction services include:

- RNeasy® preserved material
- PAXgene® samples
- Quality check of RNA with Agilent 2100 Bioanalyzer.

Our own service laboratories are located in Berlin, London and Boston, and have a complete understanding of the requirements for purified DNA in a wide variety of downstream applications. We perform sequencing and genotyping projects every day in our own laboratories and we use the technologies we have developed to provide the extracted DNA to drive each project.



LGC are experienced in DNA extraction from a wide range of starting materials. Our extraction team will select the optimal protocol for your samples based on sample type, volume / amount of tissue, and the downstream application for which the DNA is required.

Species-specific protocols can be developed where required, and we offer pilot studies in the case of materials and organisms that we have not previously tested.

We have experience in extractions from a wide range of plant species including:

1. Aphid, soybean (*Aphis glycines*)
2. Aubergine (*Solanum melongena*)
3. Barley (*Hordeum vulgare*)
4. Bean, Common (*Phaseolus vulgaris*)
5. Beet (*Beta vulgaris*)
6. Beet, sugar (*Beta vulgaris*)
7. *Begonia conchifolia*
8. Cabbage (*Brassica oleracea*)
9. Carrot (*Daucus carota*)
10. Cassava (*Manihot esculenta*)
11. Cauliflower (*Brassica oleracea*)
12. Chickpea (*Cicer arietinum*)
13. Chicory, Common (*Cichorium intybus*)
14. Clover, Red (*Trifolium pratense*)
15. Corn (*Zea mays*)
16. Cowpea (*Vigna unguiculata*)
17. Cucumber (*Cucumis sativus*)
18. Fir, Silver (*Abies alba*)
19. Flax (*Linum usitatissimum*)
20. Grape (*Vitis vinifera*)
21. Leek (*Allium Porrum*)
22. Lettuce (*Lactuca sativa*)
23. Lotus (*Lotus japonicus*)
24. Millet, pearl (*Pennisetum glaucum*)
25. Muskmelon (*Cucumis melo*)
26. *Mycosphaerella graminicola*
27. Oat, Common (*Avena sativa*)
28. Onion (*Allium cepa*)
29. Orange (*Citrus sinensis*)
30. Peach (*Prunus persica*)
31. Pepper (*Capsicum annuum*)
32. Perch, Yellow (*Perca flavescens*)
33. Pigeon pea (*Cajanus caja*)
34. Pine, Swiss or Arolla (*Pinus cembra*)
35. Potato (*Solanum tuberosum*)
36. Ragwort (*Jacobaea vulgaris/Senecio jacobaea*)
37. Rapeseed/Canola/Oilseed (*Brassica napus*)
38. Rice, Asian (*Oryza sativa*)
39. Rubber (*Hevea brasiliensis*)
40. Ryegrass (*Lolium perenne*)
41. Soybean (U.S.) soya bean (UK) (*Glycine max*)
42. Spinach (*Spinacia oleracea*)
43. Sunflower (*Helianthus annuus*)
44. Switchgrass (*Panicum virgatum*)
45. Tomato (*Solanum lycopersicum*)
46. Tobacco leaves (*Nicotiana tabacum*)

Types of samples regularly processed in our extraction laboratories:

- Animal tissue
- Blood
- Forensic samples
- Buccal swabs
- Saliva
- Bacteria and other prokaryotes
- FTA cards.

We can also perform plasmid preparations.

If this is something that you are interested in, please contact us for more information: extraction@lgcgenomics.com

Ordering information

		Part number	Description
Kits	sbeadex kits	GEN41131	sbeadex particle suspension (1 mL)
		GEN41132	sbeadex particle suspension (10 mL)
		GEN41133	sbeadex particle suspension (100 mL)
		GEN41301	sebeadex plasmid (96 tests)
		GEN41310	sbeadex plasmid (960 tests)
		GEN41403	sbeadex blood (96 tests)
		GEN41405	sbeadex tissue (96 tests)
		GEN41430	sbeadex blood (960 tests)
		GEN41450	sbeadex tissue (96 tests)
		GEN41501	sbeadex forensic (96 tests)
		GEN41510	sbeadex forensic (960 tests)
	Kleargene kits	KBS-1012-005	Kleargene 8 blood prep kit (up to 10 mL)
		KBS-1012-006	Kleargene 32 blood prep kit (up to 10 mL)
		KBS-1012-007	Kleargene 160 blood prep kit (up to 10 mL)
		KBS-1012-400	Kleargene 1 x 96 spin plate tissue
		KBS-1012-401	Kleargene 4 x 96 spin plate tissue
		KBS-1012-442	Kleargene 16 x 96 spin plate tissue
		KBS-1012-443	Kleargene 64 x 96 spin plate tissue
		KBS-1012-450	1 L L1 Buffer
		KBS-1012-451	5 L L1 Buffer (Buffer supplied in 5 L jerrican)
KBS-1012-452	25 L L1 Buffer (Buffer supplied in 25 L jerrican)		
Instruments	oKtopure	KBS-0009-001	oKtopure high-throughput DNA extraction robot
		KBS-0009-002	oKtowash™, concentrated wash buffer (500 mL)
		KBS-0009-003	oKtopure offline tip wash option
		KBS-0009-004	oKtopure mix plates (Thermo 1.2 mL deep well plate)
		KBS-0009-005	Wash buffer bulk reservoirs (pack of 4)
		KBS-0009-999	Extended 12 month on-site fully inclusive service contract
		NAP41610	sbeadex mini plant (960 tests)
		NAP41620	sbeadex maxi plant (960 tests)
		Please enquire	sbeadex mini / maxi (5000; 10,000; 20,000; 40,000 tests)
	Genespin	KBS-0010-001	96 Head Genespin high-throughput Kleargene prep robot
		KBS-0010-002	384 Head Genespin high-throughput Kleargene prep robot
		KBS-0900-023	Genespin 12 month on-site fully inclusive service contract
		KBS-1012-201	Kleargene 1 x 96 spin plate plant
		KBS-1012-202	Kleargene 4 x 96 spin plate plant
KBS-1012-210		Kleargene 16 x 96 spin plate plant	
KBS-1012-211		Kleargene 64 x 96 spin plate plant	
KBS-1012-204		Kleargene 1 x 384 spin plate plant	
KBS-1012-205		Kleargene 4 x 384 spin plate plant	
KBS-1012-212		Kleargene 16 x 384 spin plate plant	
KBS-1012-213		Kleargene 80 x 384 spin plate plant (Buffer supplied in 5 L jerrican)	
KBS-1012-214	Kleargene 400 x 384 spin plate plant (Buffer supplied in 25 L jerrican)		

Ordering

Genomics - products and services

Services

- KASP SNP and InDel genotyping
- DNA and RNA extraction services
- Sanger sequencing
- Next-generation sequencing services (Roche 454, Illumina HiSeq & MiSeq)
- Whole Genome Amplification (WGA)

Products

- KASP SNP and InDel genotyping chemistry
- DNA extraction products (sbeadex™, Kleargene™ and mag™ kits)
- Enzymes and PCR reagents (KlearKall™, KlearTaq™, KlearTaq™ HiFi)
- Whole Genome Amplification (WGA) kits and services
- Microtitre plates and seals for heat and laser sealing (96, 384 & 1536)
- SNPLine PCR workflow instrumentation:
 - Plate heat sealers (Kube™)
 - Plate laser sealer (Fusion3™)
 - Thermal cycling instruments (Hydrocycler™)
 - Assay dispensing systems (Meridian™)
 - Software (SNPviewer™, KlusterCaller™, Kraken™)
 - DNA extraction instruments (oKtopure™ and Genespin™)
 - DNA plate replicating robot (repliKator™)



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