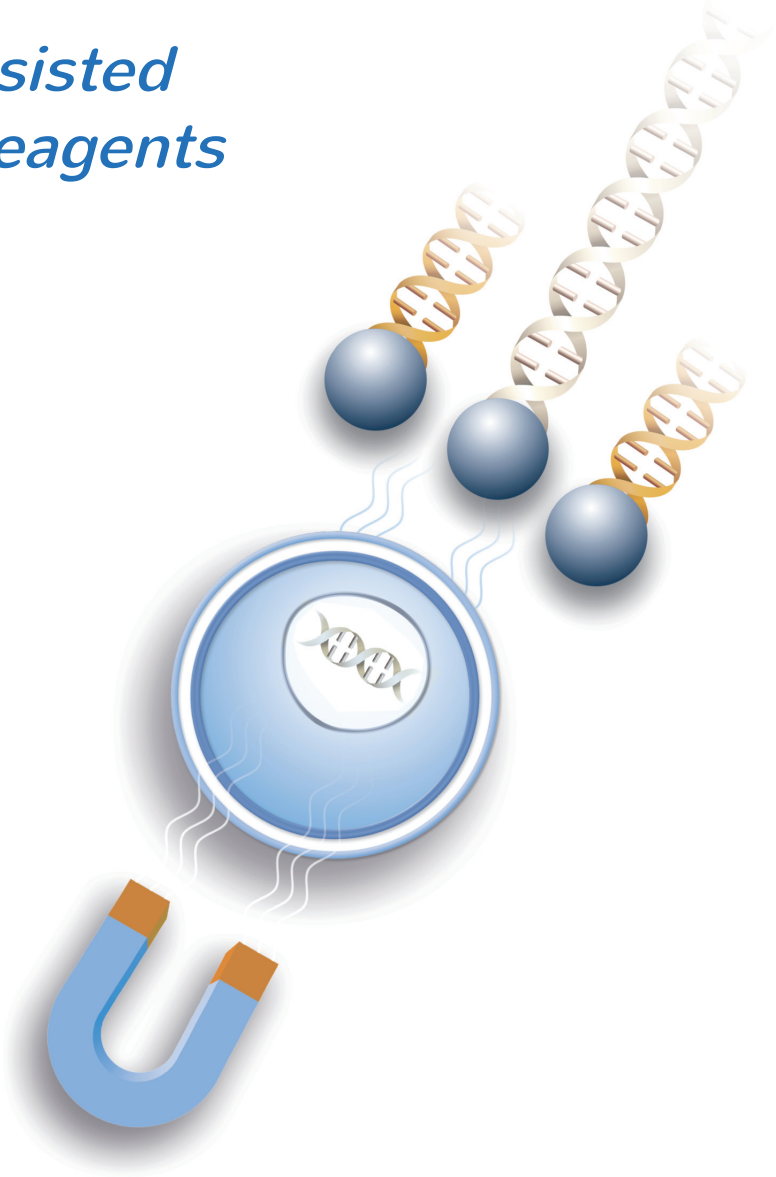
OZBIOSCIENCES
The art of delivery systems

Magnetofection™

To Transfect Primary and Hard-to-transfect Cells

Magnetic-Assisted Transfection Reagents



Enhance Transfection Efficiency

CombiMag - LipoMag - Magnetofectamine
PolyMag Neo - NeuroMag - SilenceMag

Ideal for primary cells &

MAGNETOFECTION TECHNOLOGY

Magnetofection™ is a simple and highly efficient method to transfect cells. This technology was developed to gather in one convenient system the advantages of the popular biochemical (cationic lipids or polymers) and physical transfection methods (electroporation, gene gun) while overcoming their respective limitations.

Magnetofection Benefits

- **High transfection efficiency with any nucleic acids- increases efficiency from 30 to 500%**
- **Powerful on hard-to-transfect and primary cells**
- **High performance even with low dose of nucleic acids (enable to use 10 to 100 times less nucleci acids)**
- **Concentrate genetic material onto cells / accelerate kinetics**
- **Biodegradable iron oexyde nanoparticles, safe and universal**

How does it work?

- Magnetic nanoparticles are associated with nucleic acids (naked or pre-complexed with a transfection reagent or viruses) by salt-induced aggregation and electrostatic interactions.
- Magnetic force drives these complexes towards the target cells, allowing a rapid concentration of the vector dose onto cells.
- The cellular uptake of the genetic materials is accomplished by endocytosis and pinocytosis.
- Nucleic acids are released in the cytoplasm by flip-flop mechanism or proton sponge effect*.

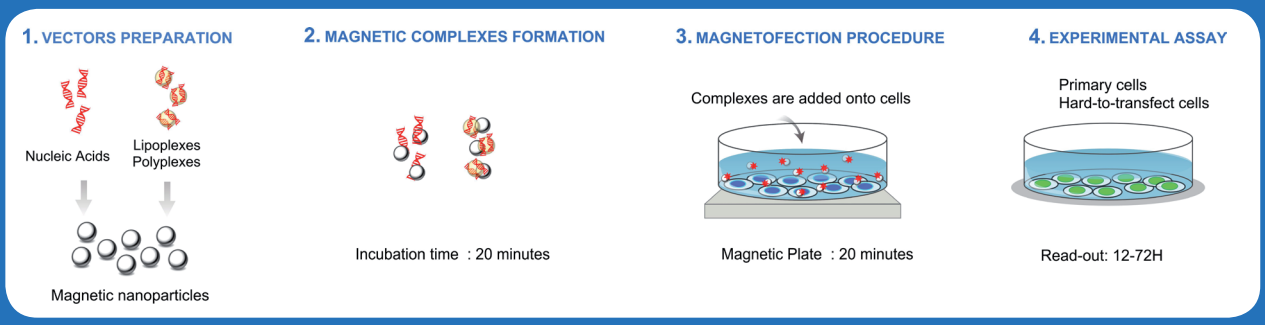


Figure 1: Magnetofection Protocol

Magnetic Plates for Magnetofection

Specific magnetic plates with optimal properties have been developed to reach the best transfection levels. For your convenience, we offer 2 magnetic plate sizes, suitable for all cell culture dishes:

- **Super Magnetic plate (8 by 12 cm)**
- **Mega Magnetic plate (20 by 26 cm)**

Plates can be used with incubators and robots.

* Plank et al, Adv. Drug Deliv. Rev. (2011), doi:10.1016/j.addr.2011.08.002

More information on www.ozbiosciences.com

Hard-to-transfect cells

Magnetofection™ is the only versatile and universal technology adapted to *in vitro* or *in vivo* applications, to all types of nucleic acids (DNA, siRNA, dsRNA, shRNA, mRNA, ODN...) and to viral and non-viral transfection systems. Consequently, several optimized reagents have been designed according to defined applications.

Magnetofection reagent selection guide

	Product	DNA	mRNA	siRNA/ miRNA	Applications
in vitro Magnetofection Primary and Hard-to-transfect Cells	CombiMag	V	V	V	Enhance transfection efficiency of any transfection reagents
	LipoMag	V			A combination of DreamFect Gold™ and CombiMag reagents
	MagnetoFectamine	V			A combination of LipoFectamine 2000™ and CombiMag reagents
	PolyMag Neo	V	V	V	Polymer-based Magnetofection reagent
	NeuroMag	V	V	V	Specifically designed for primary neurons and neural cells
	SilenceMag			V	Highly efficient for siRNA transfection
in vivo Magnetofection	*in vivo* DogtorMag	V			*in vivo* lipid-based transfection reagent
	in vivo PolyMag	V			*in vivo* polymer-based transfection reagent
	in vivo SilenceMag			V	for *in vivo* gene silencing applications

TRANSFECTION ENHANCER

CombiMag

CombiMag is a magnetic nanoparticle formulation that enables to improve transfection efficiency of any commercial transfection reagent. It can be used with all types of nucleic acids.

- Improves transfection efficiency without changing your standard protocol
- Allows creating your own optimal delivery system with an improved efficiency from 30% to 500%.
- Save materials and time

«Endothelial cells were transfected using Lipofectamine Plus* with CombiMag to achieve 76% transfection efficiency» Basile J.R. et al MCB 2005

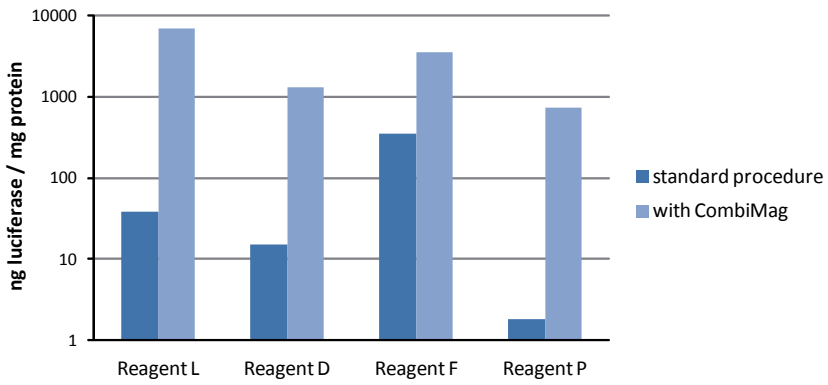


Figure 2: Luciferase expression in primary rabbit articular chondrocytes transfected with various commercial reagents without or with CombiMag. We are grateful to Dr. U. Schillinger (Technical University, Munich) for kindly providing these data.

* Lipofectamine™ is a Trademark owned by Life Technologies Corporation.

Exceed your transgene expression

LipoMag

LipoMag, a combination of DreamFect Gold™ and Combimag, was specifically developed to achieve high transfection efficiency (percentage of cells tranfected) combined with superior transgene expression level due to its improved cytoplasmic release process and complete biodegradability.

- **Highest efficiency without toxicity**
- **Superior transgene expression level than any other reagents**
- **Enhancement of DreamFect™ Gold efficiency that outperforms competitors**
- **Biodegradable**

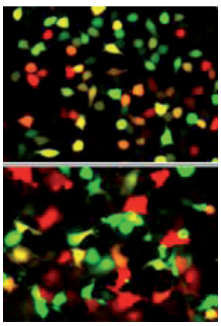


Figure 3: Co-transfection with GFP and RFP on HeLa cells.

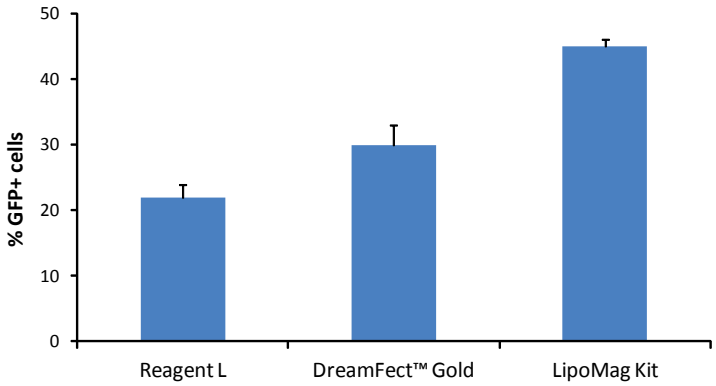


Figure 4: BEAS-2B cells were transfected with Reagent L, DreamFect™ Gold or with LipoMag Kit in a 24-well plate. GFP positive cells were monitored by Flow Cytometry 24h after transfection.

DNA

Magnetofectamine

The alliance of Lipofectamine™ 2000* from life Technologies and CombiMag reagents leads to increased transfection efficiency, minimized toxicity and enhanced gene expression.

- **Maximize transfection efficiency**
- **Less nucleic acids used - minimized toxicity**
- **No need to change your standard protocol**
- **Ideal for hard-to-transfect and primary cells**

«Successfully used to transfect miRNA into human Mesenchymal Stem Cells (huMSC)» Schade A et al, Stem Cells International, 2014

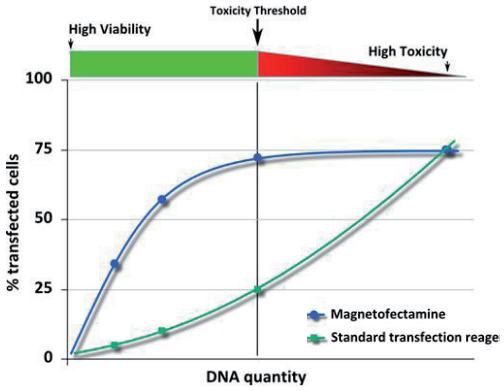


Figure 5: Comparative data of Magnetofectamine against standard transfection reagent: Magnetofectamine is effective at low doses of nucleic acids resulting in minimized cytotoxicity.

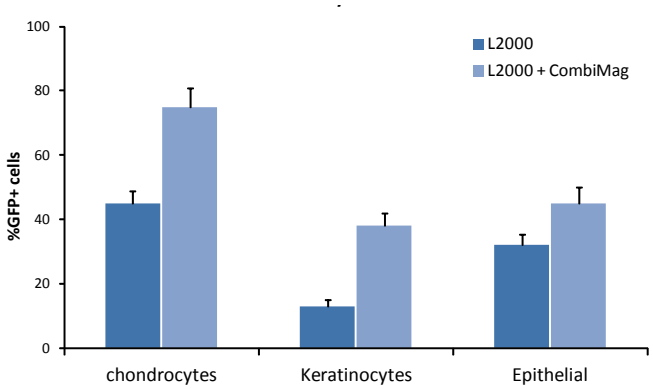


Figure 6: CombiMag transfection efficiency enhancement in primary cells. These primary cells were transfected using respectively Lipofectamine 2000 and Magnetofectamine.

DNA

* Lipofectamine™ and Invitrogen™ are Trademarks owned by Life Technologies Corporation.
Lipofectamine™ 2000 is manufactured by Life Technologies Corporation for OZ Biosciences and provided under license from Life Technologies Corporation.

by using Magnetofection...

DNA/RNA/ODN...

PolyMag Neo

PolyMag Neo, a versatile polymer-based transfection reagent, is composed of magnetic nanoparticles coated with specific cationic molecules. It enhances transfection effiency on primary cells and hard-to-transfect cells.

- **High transgene expression**
- **High transfection efficiency on primary cells**
- **High performance even with low doses of nucleic acids**
- **Multipurposes: Successfully tested with various cells and nucleic acids**

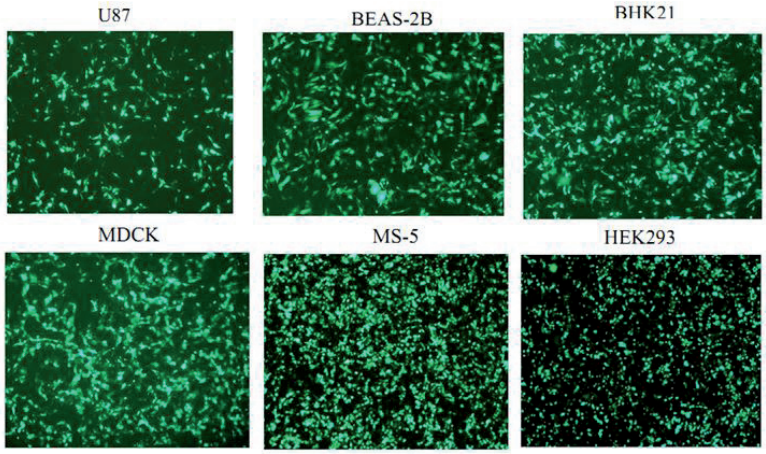


Figure 7: Cells (1x105) were transfected with 0.5µg / well of pEGFP plasmid and 0.5µL of PolyMag Neo reagent in 24-well plates. EGFP expression was monitored 24 h after transfection by fluorescence microscopy.

NEURONS

NeuroMag

NeuroMag is the first dedicated transfection reagent for neurons. It is perfect for primary neurons but also for neural and glial cells. Due to its unique properties, NeuroMag allows to follow the maturation of transfected neurons during several days after transfection.

- **Highly efficient on primary neurons: hippocampal, cortical, motor and dopaminergic neurons, glioblastoma, neuroblastoma, DRG, oligodendrocytes, neural stem cells...**
- **Efficient from 1 DIV to 21 DIV**
- **Non toxic and completely biodegradable: high transfected neurons viability**
- **Long transgene expression (up to 7 days)**
- **Suitable for all types of nucleic acids**

«High transfection efficiency on primary dopaminergic neurons at 21 DIV.»
Underhill SM et al, Neuron. 2014

«Due to its high efficiency and its low toxicity, we used NeuroMag to transfect cortical neurons to study the role of SRGAP2A protein in the regulation of spine morphology.»
Charrier C et al, Cell. 2012.

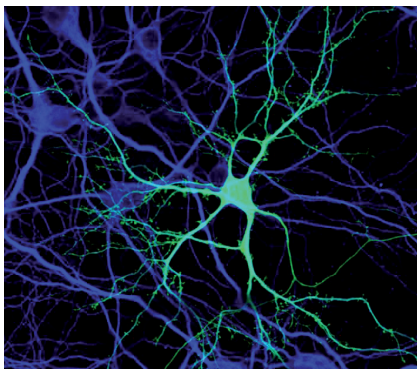


Figure 8: Primary rat hippocampal neurons 6 days after transfection with NeuroMag

Efficiency proven in more

SilenceMag

SilenceMag uses the magnetic force to enhance transfection efficiency on primary and hard-to-transfect cells or target silencing into tissues. Based on the Magnetofection technology, SilenceMag reagent gives high protein knockdown at very low doses of siRNA in numerous cell types and tissues.

- Increased silencing efficiency
- Minimized toxicity and off-target effects
- Low siRNA/miRNA doses required
- Targeted silencing (magnetically-driven)

«90% gene silencing in primary human endothelial colony forming cells» Hubert L. *et al. (2014)* J Thromb Haemost.

SilenceMag is an efficient carrier of siRNA for anti-angiogenic treatment of hepatic tumor *in vivo*. Chen *et al.* (2014) BMC Cancer

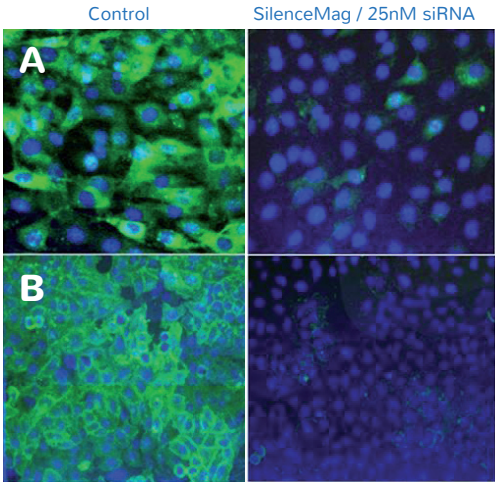


Figure 9: NIH-3T3 (A) and Hep2 (B) cells were treated with 5 µL SilenceMag and 25nM siRNA targeting GAPDH gene. GAPDH expression was monitored 72h after transfection.

siRNA

in vivo Magnetofection

In vivo Magnetofection has been designed for ***in vivo* targeted transfection and transduction**. This original system combines magnetic nanoparticles and nucleic acid vectors that are retained after injection at the magnetically targeted site. in this way, systemic distribution is minimized and toxicity is reduced. DNA complexes can be easily administrated through various injection routes such as systemic administration (intravenous, intra-artery) or local administration (intratumoral, intracerebroventricular).

- *in vivo* PolyMag, a cationic polymer-based magnetic nanoparticles formulation, designed for *in vivo* transfection of nucleic acids.
- *in vivo* DogtorMag, a cationic lipid-based magnetic nanoparticles formulation, designed for *in vivo* transfection of nucleic acids.
- *in vivo* SilenceMag, a cationic lipid-based magnetic nanoparticles formulation, designed to transfect siRNA/miRNA, into target cell/ tissue *in vivo.*

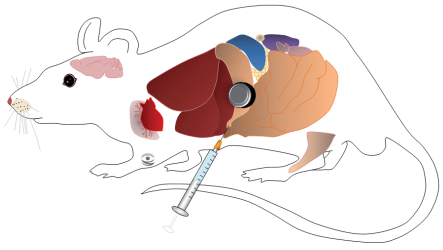


Figure 10: Targeted transfection in stomach

IN VIVO MAGNETOFECTION

than 800 publications

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MGC-803		Zhang S., Sci Rep. 2015 Apr 10;5:9787.
Primary Human Endothelial cells		Hubert L., J Thromb Haemost. 2014 Jul;12(7):1170-81
Hepatocellular carcinoma		Rong M., BMC Cancer. 2013 Jan 16;13:21
Glioblastoma		Fukushima T., J Biol Chem. 2007 Jun 22;282(25):18634-44
Lung	(*in vivo*)	Báez CA., J Nanotech. 2014 Volume 2014
Leydig Tumor Cells	**LipoMag**	Lee J., Mol Cell Endocrinol. 2015 Feb 7. pii: S0303-7207(15)00026-X
Fibroblasts (MEF)		Grzeskowiak BF., Pharm Res. 2014 Jul 18
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HUC-MSC		Schade A., Stem Cells International, vol. 2014, 2014.
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synovial fibroblasts		Frolov A., J Biol Chem. 2013 Aug 16;288(33):23696-703
Hippocampal neurons		Tyagarajan SK., J Biol Chem. 2013 Apr 5;288(14):9634-47
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Left adductor muscle	(*in vivo*)	Ohashi K., J Biol Chem. 2014 Apr 6
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Kelly		Kasim M., J Biol Chem. 2014 Aug 14. pii: jbc.M114.579391
Myometrial		Lappas M., Biol Reprod. 2013 Jul 18;89(1):14
Endothelial colony forming		Ligi I., Blood. 2011 Aug 11;118(6):1699-709
Hepatocellular carcinoma, HepG2	(*in vivo*)	Chen J., BMC Cancer. 2014 Feb 21;14(1):114
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Cortical Neurons		Mairet-Coello G., Neuron. 2013 Apr 10;78(1):94-108
Hippocampal neurons		Charrier C., Cell. 2012 May 11;149(4):923-35
Hippocampal neurons		Alavian KN., Nat Cell Biol. 2011 Sep 18;13(10):1224-33
Motor neurons derived from ES cells		Terenzio M., EMBO J. 2014 Jun 11. pii: e201387579
Brain	(*in vivo*)	Soto-Sánchez C., Nanomedicine. 2015 Feb 11. 9634(15)00036-2

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For a complete publication list, visit www. ozbiosciences.com

OZ Biosciences supplies several Magnetofection solutions:

- Increase transfection efficiency of any commercial transfection reagents - CombiMag
- High transfection efficiency of DNA with low cytotoxicity - LipoMag, Magnetofectamine, PolyMag Neo
- Ideal for siRNA/miRNA transfection to reach high gene silencing efficency in hard-to-transfect cells - SilenceMag
- High transfection of primary neurons and neural cells - NeuroMag
- Magnetofection has to be performed using the appropriate magnetic field - Super Magnetic Plate or Mega Magnetic plate

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