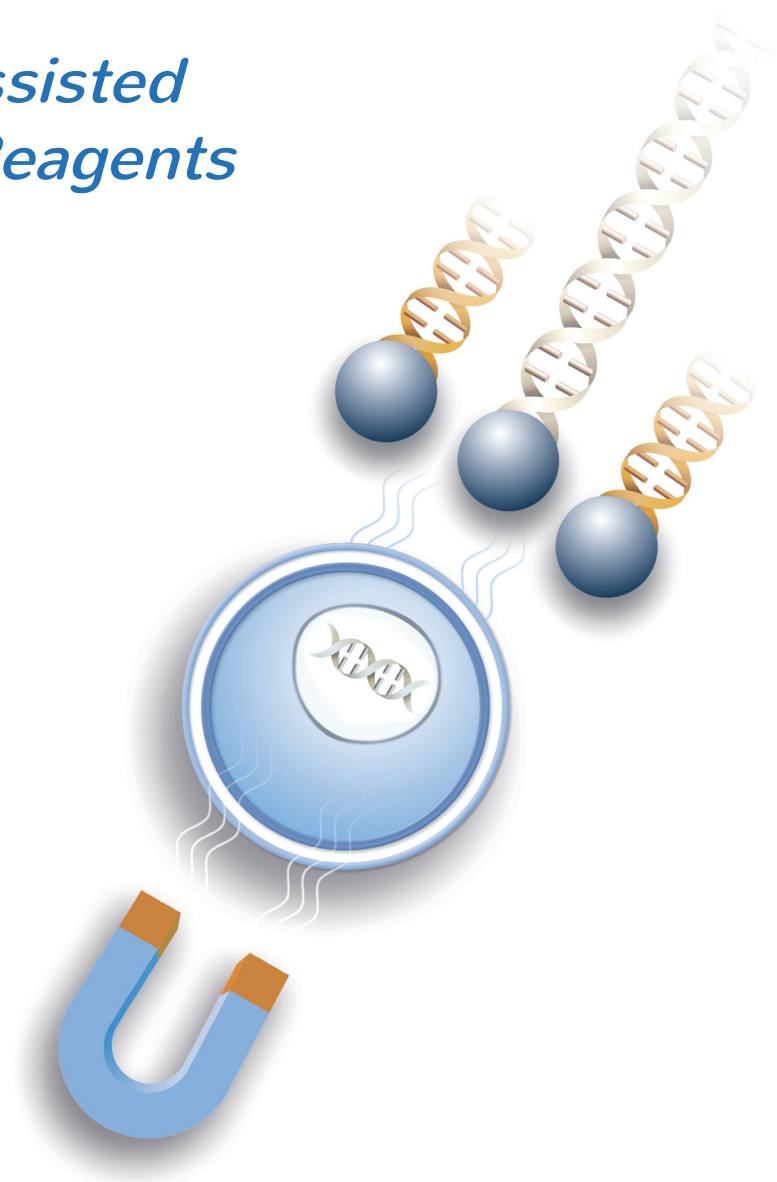




# Magnetofection™

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 nucleic acids)
- Concentrate genetic material onto cells / accelerate kinetics
- Biodegradable iron oxide 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\*.

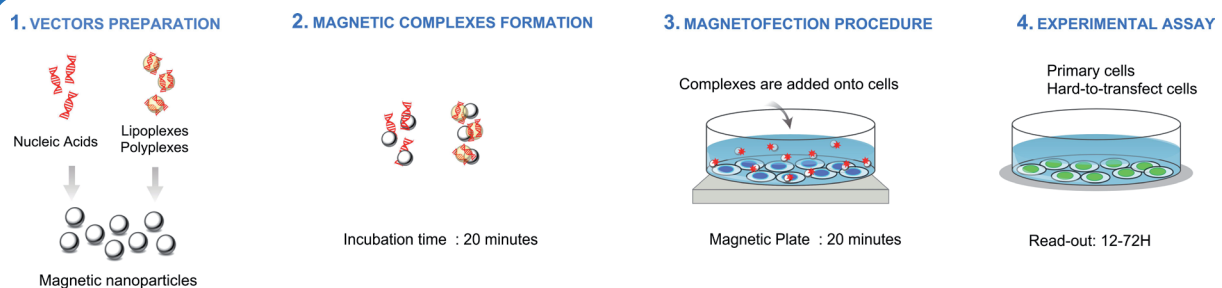


Figure 1: Magnetofection Protocol

### 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), 63(14-15):1300-31

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

## 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

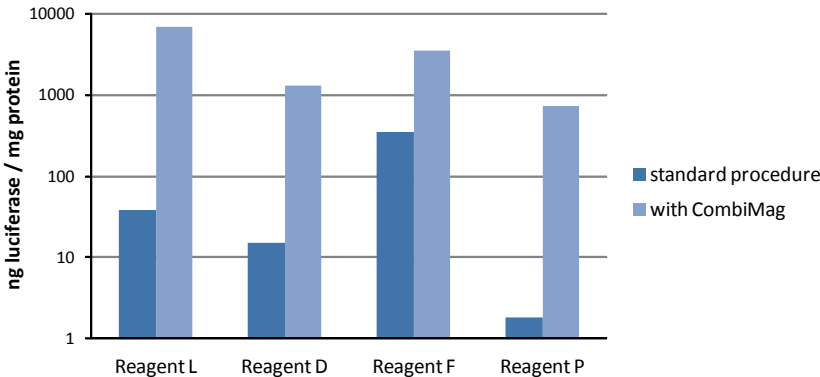


Figure 2: Luciferase expression in primary rabbit articular chondrocytes transfected with various commercial reagents without or with CombiMag. We are grateful to Dr. U. Schillinger (Technical University, Munich) for kindly providing these data.

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

TRANSFECTION ENHANCER

# Exceed your transgene expression

## LipoMag

**LipoMag**, a combination of **DreamFect Gold™** and **Combimag**, was specifically developed to achieve high transfection efficiency (percentage of cells transfected) 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

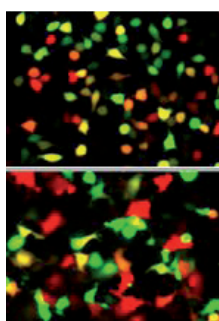


Figure 3: Co-transfection with GFP and RFP on HeLa cells.

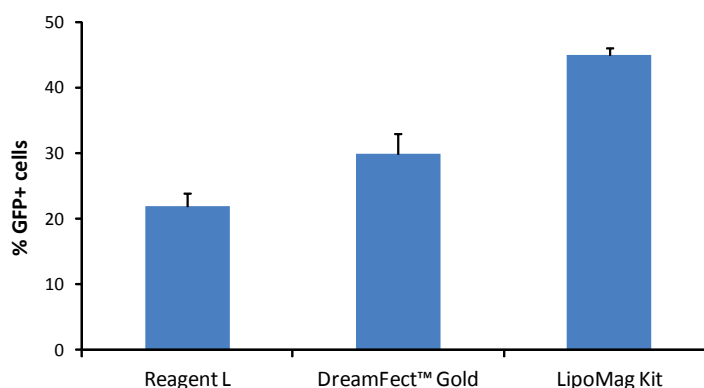


Figure 4: BEAS-2B cells were transfected with Reagent L, DreamFect™ Gold or with **LipoMag Kit** in a 24-well plate. GFP positive cells were monitored by Flow Cytometry 24h after transfection.

DNA

## Magnetofectamine

The alliance of **Lipofectamine™ 2000\*** 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

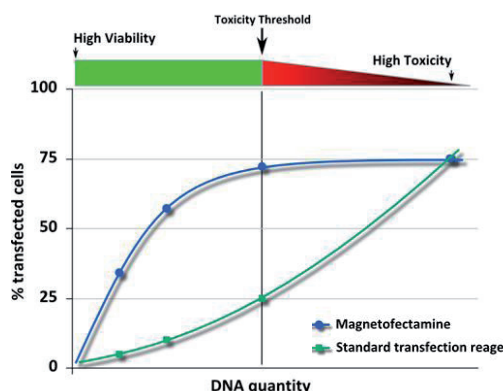


Figure 5: Comparative data of Magnetofectamine against standard transfection reagent: **Magnetofectamine** is effective at low doses of nucleic acids resulting in minimized cytotoxicity.

**«Successfully used to transfect miRNA into human Mesenchymal Stem Cells (huMSC).»**

Schade A *et al*, Stem Cells International, 2014

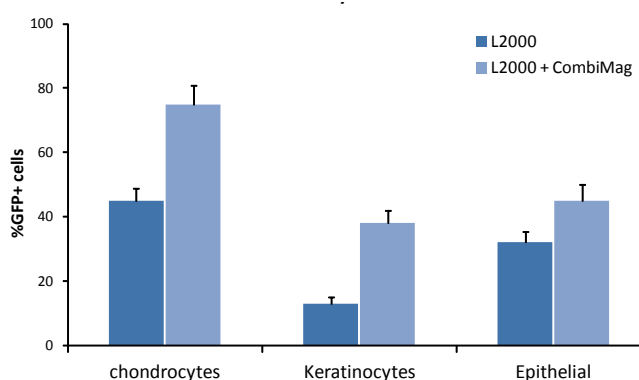


Figure 6: **CombiMag** transfection efficiency enhancement in primary cells. These primary cells were transfected using respectively Lipofectamine 2000 and Magnetofectamine.

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...

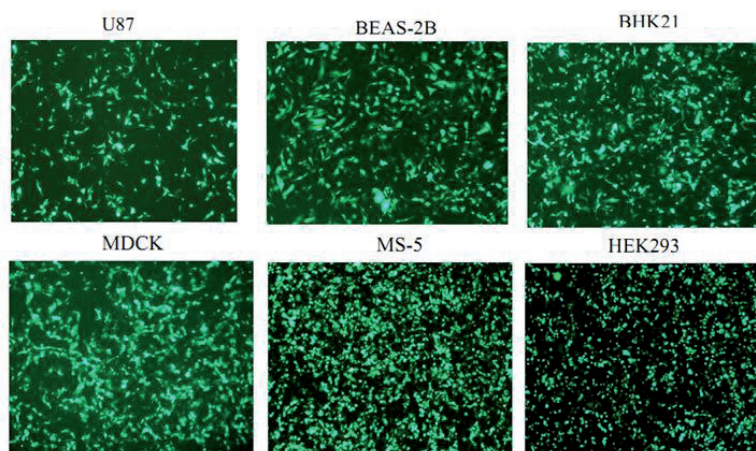
## DNA/RNA/ODN...

### PolyMag Neo

**PolyMag Neo**, a versatile polymer-based transfection reagent, is composed of magnetic nanoparticles coated with specific cationic molecules. It enhances transfection efficiency 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 ( $1 \times 10^5$ ) were transfected with 0.5  $\mu$ g / well of pEGFP plasmid and 0.5  $\mu$ L 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.

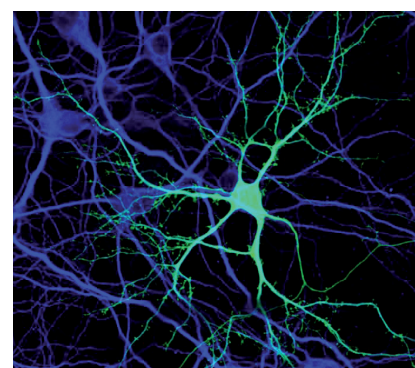
- Highly efficient on primary neurons: hippocampal, cortical, motor and dopaminergic neurons, glioblastoma, neuroblastoma, DRG, oligodendrocytes, neural stem cells...
- Efficient from 1 DIV to 21 DIV
- Non toxic and completely biodegradable: high transfected neurons viability
- Long transgene expression (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

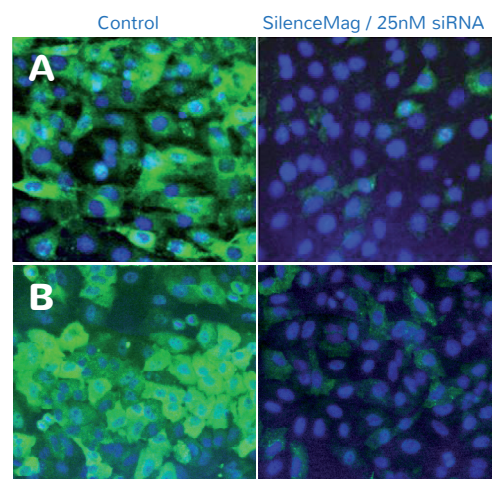


Figure 9: NIH-3T3 (A) and A549 (B) cells were treated with 5  $\mu$ L **SilenceMag** and 25nM siRNA targeting GAPDH gene. GAPDH expression was monitored 72h after transfection.

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 administered 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*.

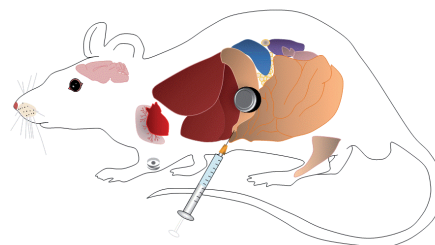
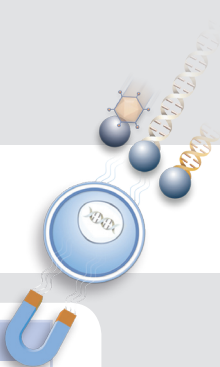


Figure 10: Targeted transfection in stomach

IN VIVO MAGNETOFECTION

than 800 publications



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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 efficiency 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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