

Date	Number	Technology	Summary
10/08/20	TGEM064	Regulation of cellular phosphate handling and intracellular energy status	Transdermal patches using nanoparticle technology for the continuous delivery of APIs as a non-invasive alternative to subcutaneous injection. Useful for small molecules and peptides including insulin. Achieves stable concentrations of APIs. Examples of use include the maintenance of blood insulin levels for the treatment of diabetes, and providing a solution for levodopa-induced dyskinesia, a side effect of L-DOPA treatment of Parkinson's disease which can be avoided by continuous transdermal delivery. Provisional patent submitted in Oct 2019 for the nanoparticle formulation. Potential for delivery through the oral or sublingual route.
09/30/20	TGEM063	Nanoparticles that can penetrate the blood brain barrier	<ul style="list-style-type: none"> <li>- Nanoparticles are coated by two substances for specificity to the tumor cells.</li> <li>- These nanoparticles exhibited a high permeability of approximately 95% in an in vitro blood brain barrier model.</li> <li>- These nanoparticles exhibited complete tumor regression and mice with brain tumors survived for 80 days without any health-related abnormalities. The mice from the other groups survived only for up to 30 days.</li> </ul>
09/29/20	TGEM062	Next-generation CAR-T cell therapy with high potency, specificity, durability, and safety	<p>Four proprietary non-viral gene and cell engineering technologies in the chimeric antigen receptor (CAR) T cell therapies for cancer treatment.</p> <ul style="list-style-type: none"> <li>-Non-virus associated gene delivery</li> <li>-Huge gene loading capacity</li> <li>-Potential lower risk</li> <li>-Lower cost of goods</li> <li>-Competitor analysis: our superior results</li> </ul>
09/08/20	TGEM061	Asymmetric Bispecific Antibody (BsAb) Technology	<p>An asymmetric BsAb technology provided to overcome the mispairing issue between the light chains and heavy chains. The BsAb targets tumor-associated antigen (TAA) on the cancer cells and its T cell activation for cancer killing is highly dependent on presence of the cancer cell.</p> <p>One example is the Anti-TAA x anti-CD3 bispecific antibody, including the following features:</p> <ul style="list-style-type: none"> <li>- Easy to Make</li> <li>- High correct pairing (&gt;95%)</li> <li>- Target cell-dependent T cell activation (Better safety profile)</li> <li>- Long in vivo half-life(T1/2~ 160 Hours)</li> <li>- Low immunogenicity in rats (No detectable ADA)</li> <li>- High production yield (Yield= 2~3 g/L)</li> </ul> <p>The BsAb can be used for cancer therapy and/or Globo H expressing tumor such as breast, pancreatic, prostate, and ovarian cancer.</p>
09/08/20	TGEM060	High-Yield Chinese Hamster Ovary (CHO) Cells Expression System	<p>TGEM060 is a CHO-C expression system for preparation of reliable and stable proteins. The CHO-C expression system features:</p> <ul style="list-style-type: none"> <li>-cGMP produced and tested CHO cell line</li> <li>-Proprietary vectors and unique signal peptides for expression of mAbs</li> <li>-Robust scale-up process to 50L bioreactor</li> <li>-High yield and high stability (up to 5 g/L; over 100 generations)</li> <li>-DNA to RCB can be completed within 6 months</li> <li>-Simplified licensing model (e.g. royalty fee free, milestone fee free)</li> </ul>

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09/08/20	TGEM059	Site specific Antibody Drug Conjugate(ADC) Platform	<p>TGEM059 is an efficient glycoengineering process for preparing a site specific glycoprotein-payload conjugate.</p> <ul style="list-style-type: none"> <li>- The process allows control of the drug:antibody ratio (DAR): the ADC produced is a homogeneous ADC with a DAR of 2 or 4.</li> <li>- Payload diversity can be achieved: the ADC can be determined to conjugate with homogeneous payloads or dual payloads for application to various cancers.</li> <li>- Simple manufacturing process: the conjugation process takes place in liquid phase, room temperature and can be completed overnight.</li> <li>- Dual-paylaod ADCs have better efficacy than random conjugated ADCs (DAR=4) in anti mesothelin and trastuzumab antibodies.</li> </ul>
09/08/20	TGEM058	Kidney-like sphere in 3D culture system	<ul style="list-style-type: none"> <li>- A novel method for the induction of a macroscopically visible three dimensional kidney-like sphere</li> <li>- No need to use iPS or ES cells</li> <li>- The very similar gene profiles to mature kidneys in human, especially natural podocytes</li> <li>- Can be prepared in 24 hours</li> <li>- Maintained a steady state for at least five days without the proliferation and a decrease in viability</li> <li>- Application <ul style="list-style-type: none"> <li>HTP screening of drugs/chemicals in the more native setting of kidney.</li> <li>Evaluation of optimal personalized medicine in AKI/CKD.</li> <li>Human kidney diseases model library</li> <li>Understanding the pathogenesis of broad diseases of kidney.</li> </ul> </li> </ul>
08/24/20	TGEM057	Fast Production of CAR-T Cells with High Quantity and Quality	<ul style="list-style-type: none"> <li>-The production is a bioprocess requiring lower number of T cells for initiation (1 to 10 million T cells), shortens the operation time to 10 days, and cultures at high cell density to 4 million cells/mL.</li> <li>-The process reduces equipment occupancy and material consumption.</li> <li>-The cell subsets were maintained at early differentiation stages, implying the increase of persistence and potency of CAR-T cells.</li> </ul>
08/01/20	TGEM055	Enucleated mesenchymal stem cell (MSC) loaded with various functional molecules and biologics	<p>TGEM055 is a disruptive new platform of therapeutics based on MSC-utilized technologies (de-nucleated, payload-carrying, designer-cell capabilities).</p> <ul style="list-style-type: none"> <li>- Nuclear DNA Removal</li> <li>- Fully Functioning Cell-Like Entity with 3-5 day Life Span</li> <li>- Robust Chemosensing, Migration, and Disease Homing Potential</li> <li>- Functional Protein Synthesis Machineries "Cell Factories"</li> <li>- Manufactural scalable, "off the shelf"-allogeneic and biobankable</li> </ul>
07/30/20	TGEM054	A fusion protein from two unique monoclonal antibody scfv sequences	<p>TGEM054 is a novel monoclonal antibody technology which works against several cancers.</p> <p>The architecture of the fusion protein is the key that locks onto a bio-marker expressed in cancer cells. Our antibody fusion protein causes apoptosis 75 % in 7 days with two doses in vitro. It has produced molecules of high caliber tested on 24 cancer cell lines with great results. (100% of cervical cancer, 90% of bladder cancer, 90% of liver cancer ).</p>
07/20/20	TGEM053	Intranasal drug delivery	<p>This novel Nose-to-Brain formulation allows the delivery of different molecule types (small molecules, peptides, etc.) to the brain, bypassing the blood-brain barrier and travelling along the olfactory and trigeminal nerves. This is more efficient than intravenous injection, elicits a faster onset of pharmacological activity, and requires a lower dose while ensuring a high brain concentration and low systemic concentration. This reduces side effects which are caused by the drug's systemic action. The simple administration can be in the form of drops, sprays, pumps, cotton swabs, etc. This novel nanoparticle formulation is biodegradable and therefore safe, and can also be administered via sub-lingual, transdermal and possibly oral routes. The patent was submitted in 2020.</p>

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06/18/20	GEM207	DNA plasmid for Immunotherapies	Our original vector is designed to take manufacturing from outside the patient to inside the patient, using the patient's own cells to manufacture the necessary protein-, DNA- and RNA-based treatments.
05/27/20	TGEM051	Technologies for recreating extracellular matrix-driven cancer progression and quantifying the effects of therapeutics	Hyaluronic acid in the tumour microenvironment presents biochemical cues that drive cancer progression. Biomimetic hydrogels with hyaluronic acid are used to recreate mechanisms of cancer progression to visualise the spread of cancer from local invasion to metastasis in an organ-on-a-chip. Machine vision constructs 3D maps for each patient sample in the organ-on-a-chip to track the location and health of cancer cells. Treatments are tested in parallel to compare their effects on halting cancer progression. Applications include target/drug discovery and patient selection for translational and clinical trials.
05/08/20	TGEM050	AI for Small molecule discovery service	TGEM050 performs multi-property inverse QSAR/QSPR, powered by generative AI, to discover novel, efficacious, safe, and synthesizable drug like compounds. Properties to be optimized are defined by the customer: pharmacological activity, synthesizability, ADME, and toxicity. TGEM050 can output any number of molecular structures defined by the customer, and can be re-run quickly to generate more optimized structures based on feedback.
05/07/20	TGEM049	AI based predictions for best candidate drugs	AI/ML drug discovery platform technology that predicts protein-small molecule activity. The platform can predict activity for not well characterized protein targets that have only primary sequence data available. This technology enables ultra high-speed screening for activity and specificity. The platform can be used in a wide array of applications to discover novel and repurposable drugs. It can be used for scanning molecule libraries for COVID-19 at the shorter term.
04/08/20	TGEM048	Manufacturing and use of stem cell-derived active substances	Supernatant containing stem cell-derived multiple substances which enable promoting gene expression related to tissue engineering such as growth factors. The supernatant may be used for cosmetics, and pharmaceuticals for the treatment of atopic dermatitis, alzheimer and reumatoid arthritis.
03/06/20	TGEM047	Innovative transparent film-forming and bioadhesive delivery technology	TGEM047 is a versatile topical bioadhesive film-forming vehicle (platform) with occlusive or semi occlusive characteristics and sustained release properties for an adequate vehiculization of lipophilic and hydrophilic components. It can also be used as a vehicle for the inclusion of other technologies (micro, liposome, nanoparticles etc). This technology has been successfully applied to different topical molecules demonstrating an improvement on the API's bioavailability profile as well as providing more adequate formulations for patient treatment adherence.
03/06/20	TGEM046	Proliferation control of Mononegavirales using photoswitching system	Mononegavirales are promising tools as oncolytic vectors and transgene delivery vectors for gene therapy and regenerative medicine. By using the specifically designed proteins, which reversibly heterodimerize upon blue light illumination, photocontrollable mononegaviruses (measles and rabies viruses) were generated. The proteins were inserted into the flexible domain of the viral polymerase, and the oncolytic virus showed strong replication and oncolytic activities only when the viral polymerases were activated by blue light illumination. Treatment of this oncolytic virus resulted in a substantial reduction in tumor growth and prolonged survival under the blue light.
03/06/20	TGEM045	Superior gene expression using photoswitching system	Fusion system of CRISPR-dCpf1 and novel photoswitching system. An improved split dCpf1 activator, which has the potential to activate endogenous genes more efficiently than a previously established dCas9 activator. The split dCpf1 activator can efficiently activate target genes in mice and provides an efficient and sophisticated genome manipulation in the fields of basic research and biotechnological applications.
03/06/20	TGEM044	ON/OFF control of mice genome recombination using photoswitching system	Fusion system of Cre-loxP recombination system and novel photoswitching system. Enables sharp induction (up to 320-fold) of DNA recombination and is efficiently activated even by low-intensity illumination (~0.04 W m <sup>-2</sup> ) or short periods of pulsed illumination (~30s). Allows for efficient DNA recombination in an internal organ of living mice through noninvasive external illumination using an LED light source.

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03/06/20	TGEM043	ON/OFF control of gene expression using photoswitching system	Fusion system of CRISPR-dCas9 and novel photoswitching system. Enables high blue-light-inducible activation of endogenous target genes in various human cell lines. Induced neuronal differentiation in iPS cells by achieving the activation of target genes.
03/06/20	TGEM042	ON/OFF control of gene editing using photoswitching system	Fusion system of CRISPR-Cas9 and novel photoswitching system. Induces targeted genome sequence modifications through both nonhomologous end joining and homology-directed repair pathways in response to blue light irradiation and can be switched off simply by extinguishing the light. Determines time-specific and location-specific activation by the irradiation.
03/06/20	TGEM041	Novel photoswitching system for optogenetic control of gene editing and expression	This system consisting of two proteins can control the activity of cellular proteins by the optogenetic method. These new proteins were engineered to enhance light-induced heterodimerization and show faster kinetics than any of the other conventional dimerization-based blue spectrum photoswitches. This is a powerful tool that can optogenetically manipulate molecular processes in biological systems.
02/18/20	TGEM040	Genome editing technology using oligonucleotides	The genome editing technology uses oligonucleotides only and requires neither protein nor double-strand break. Editing is highly selective and there are no by-product, which enables editing as intended without off-target risks. Easy administration to living body.
02/12/20	TGEM039	Multi Targeted Drug Delivery using Peptide Drug Conjugates (PDC's)	A novel Smart, Multi-Armed linker which is patented. The linker can bind up to three payloads –chemotherapeutic agents for treatment or fluorescent for diagnostics. The linker releases the payloads only in the Tumor cells and only after release the drugs become active and the fluorescent changes colors or starts to shine. We proved that Conjugates with dual drug payloads (multi-loading) resulted in enhanced cytotoxic effect towards cancer cells and less drug resistance evolved in comparison with mono-loaded counterparts. The novel linker can be used for PDC's, Antibody DC's(ADC's) and Nano-particle DC's(NDC's). An innovative technology for PDC's - a unique technology to synthesize cyclic peptides which are stable, selective and non-immunogenic. We can identify Receptors which are overexpressed in certain forms of cancer and synthesize peptides which will bind to these receptors so that we can use them for Targeted Drug Delivery.
01/16/20	TGEM038	A novel cell therapy platform to regenerate tubular organs	Proprietary and biocompatible scaffold (temporary cell delivery device) is combined with a patient's own cells (haematopoietic stem and precursor cells) to create an esophageal implant that could potentially be used to treat pediatric esophageal atresia and other conditions that affect the esophagus. TGEM038 can also be extended to other tubular organs, including the bronchi and trachea.
01/08/20	TGEM037	Novel <i>Escherichia coli</i> - <i>Mycobacterium</i> shuttle vector	TGEM037 has the following strengths compared to other vectors and expected to induce enhanced immune responses. <ul style="list-style-type: none"> <li>• High stability and compatibility</li> <li>• High copy number in mycobacteria</li> <li>• Stable expression of exogenous genes in mycobacteria</li> </ul>
12/24/19	TGEM036	Proprietary plant-based technology platform for rapid development and production of specialty antibody and protein drugs	The production platform has the following advantages. High yield production of antibodies and proteins, mammalian-type glycosylation (to eliminate the risk of an unwanted immune system reaction), manufacturing products that are hard to express by fermentation, low cost production, etc. The platform has been utilized for production of many antibodies and vaccines.
11/29/19	TGEM035	Effective platform using highly branched glucan for DDS carrier	Highly branched glucan has very attractive characteristics, such as a spherical nano-sized particle, high water solubility, narrow molecular size distribution, and the numerous modifiable residues, as a dendrimer for pharmaceutical application. Established technology enables to control the average particle size of this glucan between 10 nm and 50 nm strictly, and to conjugate the functional substances, such as peptide, nucleotide, sugar chain, anticancer drug, and antibody, on the surface of its particle arbitrarily. The structural features of this polymer could permit drug delivery to specific tissues and multivalent interactions with target molecules. This glucan is an effective platform for DDS carrier such as vaccine and anticancer drug.

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11/05/19	TGEM034	Innovative platform technology for targeted delivery of therapeutics	A proprietary biomimetic vector (a short peptide that binds to proteoglycan-rich tissues) can be fused with a wide variety of therapeutics (proteins, small molecules etc) and enables delivery of locally injected therapies to the hard-to-reach tissues where they are needed. Sustained therapeutic levels within the targeted tissues can increase efficacy and avoid systemic adverse events.
11/05/19	TGEM033	Long-term sustained release microformulations	This technology platform enables long-term sustained release of a drug into the blood from the administration site and treatment with once in 1 month to 6 months. The best polymer among more than 15 kinds of polymers can be proposed based on the results of feasibility studies. Opportunity for using this technology is limited to Japanese companies.
09/30/19	TGEM032	Cell Therapy technology platform for developing cell-based products for multiple chronic diseases	Novel and proprietary cell therapy platform technology that can be used for the development of cellular therapies. Cellular therapies are the new modality of treatment that provides long-term cures for chronic diseases. This platform can be applied across multiple disease areas-musculoskeletal disorders, urogynecology, oncology, cardiology. Three pronged approach to tackle degenerative diseases through drug/biologic/device mechanisms.
08/21/19	TGEM031	Delivery of anticancer drugs to cancer cells	TGEM031 is a modified $\beta$ -Cyclodextrin and increased in vitro antitumor activities of doxorubicin (DOX), vinblastine and paclitaxel. The complex of DOX with TGEM031 markedly increased antitumor activity of DOX, after intravenous administration to tumor-bearing mice.
07/31/19	TGEM030	Innovative technology enabling improved GI absorption of the insoluble drug	A patented technology based on lipidic compositions which form optimal dispersed phase in the gastrointestinal environment for improved absorption of the insoluble drug. TGEM030 enables development of superior oral products with: Improved solubilization and high drug loading capacity, improved bioavailability, faster and more consistent absorption leading to reduced variability and reduced sensitivity to food effects. TGEM030 utilizes bioacceptable excipients and conventional manufacturing processes.
07/08/19	TGEM029	Sustained release PLGA	Poly lactide-co-glycolide acid (PLGA) microsphere technology for sustained release of drugs. Versatile drug release profiles could be achieved by adjusting the formulation compositions and effective plasma drug concentration could be maintained for several weeks or months upon one injection. In addition, the pharmacokinetic and pharmacodynamics evaluation models for sustained release technology have been established which could speed up product development.
07/08/19	TGEM028	Posterior eye delivery	An ocular delivery technology specially designed to topically deliver hydrophobic small molecular across ocular tissues into posterior ocular tissues. The eye drop based delivery technology can overcome the delivery obstacle of tissue barriers to transport therapeutics to posterior ocular target tissue. This breakthrough technology is expected to bring broader applications for posterior ocular drug delivery
07/08/19	TGEM027	Site-specific linker toxin	The disadvantages of traditional conjugation technologies include the lack of specificity at the connecting positions of the antibodies and the variable number of connections. The new technology can overcome these disadvantages by improving homogeneity of ADC via site-specific conjugation. The site-specific linker-toxin shows better homogeneity, stability and efficacy.
07/08/19	TGEM026	Intracellular delivery	This technology enables peptide and oligonucleotide drugs to be delivered efficiently into cells through conjugating a cell-penetrating motif (CPM) onto drug candidate. Unlike liposomal or other nanoparticle formulation, the CPM technology requires no encapsulation process and provides formulated drug product with high stability and storage condition tolerances.
06/06/19	TGEM025	Innovative proteoliposome methodology for rapid discovery of biomarkers, ligands and/or receptors	A newly developed one-step direct transfer technology for MALDI-mass spectrometry (MS) can eliminate time-consuming intermediate processes and separate or remove plasma high abundant proteins, and therefore is useful for rapid and efficient peptide profiling of biological samples. In addition, this technology can be used for rapid identification of ligands and cell surface receptors including GPCRs and GPI anchors by combining with a library of membrane proteins keeping binding capability reconstituted on artificial phospholipid bilayers of liposomes.

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05/30/19	TGEM024	Novel lymphatic delivery system	A novel hyaluronic acid-based nanocarriers that could deliver more drug to lymph nodes. This delivery system may offer significant advantages for the use of platinum medicines in the management of locally advanced cancers. Organic solvent-free nanocarriers process. <del>Active targeting to lymph node and tumor</del>
05/30/19	TGEM023	Innovative formulation for insoluble drugs	Novel platform of formulation design and evaluation include concept of formulation design, composition of formulation, in vitro dissolution study, and in vivo absorption test. This new concept of formulation design utilizes solubility buster with traditional excipient to resolve solubility problem of drugs. This platform could be widely applied to BCS II drugs and shorten development process. Traditional excipient and solubility buster are commercial products that are easy to purchase without limitation.
04/02/19	TGEM022	Innovative nanoparticle formulation	Achieved higher content of drug, more homogeneous particle size distribution, lower cost (1/10) and easier mass production compared to conventional methods. Easy to control particle size (2 nm ~ 500 nm). Provide DDS function to the drug and stay the drug in the cell for a long time. Enable re-development of compounds that abandon development with side effects and insufficient effect. The substrate used in the nanoparticle formulation are used in approved medicines (FDA).
02/12/19	TGEM021	A unique and effective transdermal delivery technology for small molecule drugs	Can formulate patches with very high payload: Up to 50wt% achieved for drug and excipients, Extended release (24h up to 7-day) formulations possible, Fantastic adhesion, Water-resistant, Comfortable to wear and to remove. Efficient release of drug with improved skin penetration through formulation of free base/acid of API (not a salt)
01/11/19	TGEM020	Corporate alliance program with prestigious academia	One of the best universities in the world is looking for corporate partners for its corporate alliance program. The program typically takes 3 years, and the corporate partner is expected to fund projects jointly undertaken by the university and the partner. The partner will have options to exercise further developments from the result of the projects. The university carefully selects its partners.
01/07/19	TGEM019	Novel patented dermal delivery system	Silica delivery particles are loaded with an active ingredient. Technology is compatible with most small molecule/peptide payloads. The silica particles embed into the stratum corneum creating a reservoir of active ingredient diffusing out over a 12-24 hour time period (depending on active). The particles can be tuned based on desired active and properties to adjust loading, release rate, and others. Depending on the chosen payload and the clinical objective, the particles can be as small as ~300 nanometers in size...and up to ~10 microns. Demonstrated efficacy and safety in multiple animal models of disease. Breakthrough technology with strong IP protection. Applications in Rx, cosmeceutical, and animal health.
12/10/18	TGEM014	Determination method for NK cell activity	Simple and quick method for determination of NK cell activity which is applicable to whole blood. The amount of IFN- $\gamma$ or TNF- $\alpha$ produced by activated NK cells in whole blood is used as an indicator of NK cell activity. Neither radioactive isotopes nor separation steps from blood cells are required.
10/09/18	TGEM013	SUMO-fusion protein expression technology	Enables the efficient lower-cost production and purification of high quality, correctly folded proteins useful in all applications of protein preparation and drug discovery. High expression levels Variations optimized for insect, mammalian, E.coli and yeast. Non-exclusive licensing.
10/09/18	TGEM012	The methods and tools relating to UPS	The methods and tools for discovery of ubiquitin pathway system (UPS) enzyme functions and modulating molecules. This technology enables the following assays. HTS and validation assays of deubiquitinase (DUB) activity and E2, and E3 ligase Cellular ubiquitylation activity We are launching a new proteomics service that utilizes the TUBE technology to get better mass spec data about ubiquitylated proteins.

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08/31/18	TGEM011	Novel topical drug delivery technology	<p>Enables superior transdermal penetration of active ingredients to the target tissue</p> <p>Suitable for most APIs and drug classes</p> <p>Minimizes systemic exposure and side effects</p> <p>Improved API photostability (No degradation upon sun exposure)</p> <p>Formulated with all GRAS (generally recognized as safe) excipients</p>
08/27/18	TGEM010	Fucosylation technology for cell immunotherapy	<p>Improved delivery of therapeutic cells</p> <p>Applicable to hematopoietic stem cells, cytotoxic and regulatory T cells (Treg), CAR-T, mesenchymal stem cell and NK cells</p> <p>Simple and rapid procedure</p>
07/09/18	TGEM009	Technology establishing cancer stem cell	<p>Established the cancer stem cell model that can produce in vivo tumor from one cancer stem cell. In vivo tumor were formed from 10 cells in cell lines established from patient derived tissue of metastatic colorectal cancer as well as from in vitro cell lines.</p>
07/05/18	TGEM008	A platform technology that allows any cell to continuously produce a bioluminescent signal representative of its real-time metabolic activity level	<p>This technology removes steps from, and allows the continuous measurement of, cell-based in vitro and animal imaging-based in vivo assays. No negative effects on host cells and correlation with alternative assays are validated. Licenses available for pre-made cell lines or the technology platform.</p>