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Zacks Small-Cap Research

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Aptorum Group Limited (APM-NASDAQ)

Aptorum Focused on Development of Diseases with Significant Global Unmet Needs

APM further diversified their shots on goal w/ 3 major announcements in Q2'19; an agreement with Aeneas Capital and A*ccelerate Technologies to co-fund healthcare start-ups in Singapore over the next 5 years, the establishment of Smart Pharma, a new subsidiary focused on discovering 10 repurposed drug candidates/year and establishment of a subsidiary focused on the role of gut microbiota on major diseases such as metabolic and cardiovascular diseases and cancer.

Current Price (06/26/19)	$26.30
Valuation	**NA**

OUTLOOK

Aptorum is a Hong Kong based pre-revenue company focused on the development and eventual commercialization of a range of therapeutics in neurology, infectious diseases, gastroenterology, oncology and other disease areas. Product candidates are sourced and licensed through collaboration agreements with leading academic institutions. Their targeted focus largely rests on diseases and conditions which represent significant unmet global healthcare needs and/or those considered orphan diseases. Aptorum currently has exclusive licenses covering 12 distinct technologies, all of which are in preclinical stages. Among these are their three lead programs, which focus on novel therapeutic targets. These include; ALS-1, a small molecule drug candidate being developed for the treatment of influenza A virus, ALS-4, a small molecule drug candidate being developed for the treatment of bacterial infections caused by Staphylococcus aureus including Methicillin-resistant Staphylococcus aureus (MRSA) and NLS-1, a small molecule drug candidate being developed as a novel treatment for endometriosis.

SUMMARY DATA

52-Week High	**$33.28**
52-Week Low	**$11.80**
One-Year Return (%)	**N/A**
Beta	**N/A**
Average Daily Volume (sh)	**8,284**
Shares Outstanding (mil)	**29**
Market Capitalization ($mil)	**$756**
Short Interest Ratio (days)	**N/A**
Institutional Ownership (%)	**0**
Insider Ownership (%)	**29**
Annual Cash Dividend	**$0.00**
Dividend Yield (%)	**0.00**
5-Yr. Historical Growth Rates	
Sales (%)	**N/A**
Earnings Per Share (%)	**N/A**
Dividend (%)	**N/A**
P/E using TTM EPS	**N/A**
P/E using 2019 Estimate	**N/A**
P/E using 2020 Estimate	**N/A**
Zacks Rank	**N/A**

Risk Level	**N/A,**
Type of Stock	**Small-Growth**
Industry	**Med-Drugs**
Zacks Rank in Industry	**N/A**

ZACKS ESTIMATES

Revenue
(in millions of $)

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2017					
2018					0 A
2019					N/A
2020					N/A

Price/Sales Ratio (Industry = 2.5x)

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2017					
2018					-$0.53 A
2019					N/A
2020					N/A

Zacks Projected EPS Growth Rate - Next 5 Years % **N/A**

SNAPSHOT

Aptorum Group Limited (Nasdaq: APM) went public through an initial public offering which closed in December 2018 and raised $12.0M (gross) from the sale of 761k common shares. The shares were added to the Morgan Stanley Capital International (MSCI) Hong Kong Micro Cap Index in May 2019.

Aptorum is a Hong Kong based pre-revenue company focused on the development and eventual commercialization of a range of therapeutics in neurology, infectious diseases, gastroenterology, oncology and other disease areas. Product candidates are sourced and licensed through collaboration agreements with leading academic institutions. Their targeted focus largely rests on diseases and conditions which represent significant unmet global healthcare needs and/or those considered orphan diseases. Aptorum currently has exclusive licenses covering 12 distinct technologies, all of which are in preclinical stages. Among these are their three lead programs which includes;

- ALS-1, a small molecule drug candidate being developed for the treatment of influenza A virus by acting on a novel target, viral nucleoproteins (NP), which have been shown to be essential in proliferation of the virus. Evidence to-date shows ALS-1 triggers the aggregation of NP, thereby preventing their entry into the nucleus and inhibiting replication. Moreover, in vitro studies have also shown that ALS-1 may have utility across a broad range of NP variants. As NP represents a novel target, it is hypothesized that ALS-1, if successfully developed, would not be susceptible to acquired resistance as are currently available influenza A treatments (such as Tamiflu, the most widely prescribed treatment for the virus). The potential target market for ALS-1 is represented by the three to five million cases of severe influenza that occur worldwide each year, which result in between 290k and 650k deaths. Driven in part by anticipated demand for novel therapies, industry experts forecast the global market for influenza drugs to double, from $600M in 2016 to $1.2B by 2025.
- ALS-4, a small molecule drug candidate being developed for the treatment of bacterial infections caused by Staphylococcus aureus including Methicillin-resistant Staphylococcus aureus (MRSA). ALS-4 represents the world's first application of chemical genetics to address MRSA infection. ALS-4 targets an enzyme that shields Staphylococcus aureus, including MRSA, from the immune system, a novel approach to addressing bacterial infections and one that could mitigate the significant and growing threat of antibiotic-resistant bacteria. Preclinical findings were published in mBio in 2017 and were the subject of the 1st Prize of the Innovation Academy Award at the 4th International Conference on Prevention & Infection Control that same year. If successfully developed, ALS-4 could complement or even replace currently available antibiotics, the effectiveness of which continues to wane as bacteria becomes more and more resistant. ALS-4 may be eligible to leverage FDA's new LPAD pathway which is designed to speed approval of novel antibacterial drugs. The potential U.S. market for ALS-4 is represented by the ~126k hospitalizations and 94k invasive infections associated with MRSA each year. Globally, approximately $3B is spent each year on MRSA-related drugs.
- NLS-1, a small molecule drug candidate being developed as a novel treatment for endometriosis, a condition whereby tissue that lines the uterus abnormally grows on the outside of it and for which there is no effective cure. In vitro and animal models have indicated that NLS-1, a molecule extracted from green tea, may inhibit angiogenesis of endometriosis-related lesions and result in a significant reduction in the size and number of lesions. Moreover, safety appears acceptable. The potential market for NLS-1 is represented by the approximate 176M women globally, including seven million in the U.S., that suffer from endometriosis.

Assuming continued success in preclinical development, Aptorum believes that they may be in a position to file for an Investigational New Drug Application seeking regulatory approval to commence clinical studies for one or more of these candidates by 2020 or 2021. In addition to the U.S., the company has indicated that their strategy may also potentially include pursuit of clinical studies in China as well as in Europe.

In addition to these three lead candidates, Aptorum has several other, mostly earlier-stage, therapeutic programs underway that similarly focus on unmet clinical needs. These include a next-generation small molecule targeting Staphylococcus aureus (including MRSA), programs related to both the diagnosis/imaging and treatment of Alzheimer's disease, an extract from Chinese Yam targeting menopausal symptoms and a derivative from Ephedra paychyclada for the treatment of liver cancer, among others.

The company also has a non-therapeutics segment which encompasses;

- Development of surgical robotics and medical devices, which is operated through their Signate Life Sciences Limited subsidiary. The initial project, named SLS-1, is a robotic catheter platform for intraoperative MRI-guided cardiac catheterization. Given the potential for a less rigorous regulatory

pathway with medical devices (as compared to drugs and biologics), the time-to-market for SLS-1, if successfully developed, could be faster than the company's therapeutic candidates

- An outpatient clinic, which is operated through their Aptorum Medical Limited (AML) subsidiary. The clinic's initial focus is the treatment of chronic diseases associated with sedentary lifestyles. Aptorum expects that their AML Clinic, which began operations as 'Talem Medical' in June 2018, to reach operating profitability within 18 months of operating at full capacity. AML sales, however, are not expected to be sufficient enough to fully fund the company's other projects

While the company's main focus is on developing their three lead candidates, they also plan to dedicate some time and resources towards their earlier-stage therapeutic projects as well as in developing SLS-1 and the AML Clinic. Aptorum may also seek new licensing and development opportunities that fit within the scope of their selection criteria, namely candidates that address unmet medical needs such as orphan diseases. This strategy should provide some level of risk diversification and at the same time, increase the chances of ultimate success of one more projects. The company will also seek grants from the Hong Kong government, which has the potential to provide significant and non-dilutive funding.

The company further diversified their shots on goal with three significant announcements in Q2 2019;

- in April they announced an agreement with Aeneas Capital Limited and A*ccelerate Technologies Pte Ltd., to co-fund healthcare and technology start-ups in Singapore over the next five years. The companies anticipate investing $90M to create up to 20 new healthcare-focused ventures.
- also in April they announced the establishment of Smart Pharma, a new subsidiary. Smart Pharma (SmartP) will operate "Smart-ACT", which Aptorum notes is its "its novel computational repurposed drug discovery, modeling and validation platform." Smart-ACT is an acronym for Accelerated Commercialization of Therapeutics and, per the April press release, "encompasses state-of-the-art technology in systematic screening of existing approved drug molecules against selected therapeutic targets." APM anticipates that the subsidiary will initially focus on the evaluation of molecules for orphan and other under-served disease. The aim is to identify up to 10 repurposed drug candidates (the development of which can often be relatively accelerated given already well-established safety profiles) per year. Concurrent with the announced establishment of Smart Pharma, APM reported the launch of 'Smart Pharma token' (SMPT). SMPT, a token backed by the IP and future proceeds from the licensing/sale of drugs created through the Smart-ACT program, was jointly developed with blockchain company, Aenco.
- in May Aptorum announced the establishment of Claves Life Sciences Limited, a subsidiary focused on the role of gut microbiota on major diseases such as metabolic diseases, cardiovascular disease, cancer, neurodegenerative diseases and others.

The intellectual property underlying Aptorum's pipeline assets includes 12 U.S. patents and five pending U.S. non-provisional patent applications for which they are the exclusive licensee. Aptorum also owns two U.S. provisional patent applications. Moreover, they are also the exclusive licensee of several international patents and patent applications.

Innovation, product development, pipeline expansion and, eventually, clinical trials are facilitated through close collaborative ties with several leading academic institutions and clinical research organizations. Among these are the University of Hong Kong and the Chinese University of Hong Kong, both of which are accredited by the China Food and Drug Administration (CFDA) to conduct clinical trials – which potentially further facilitates eventual regulatory approval in the world's most populous country.

Lead Programs

Drug and Device Candidates									
Projects	Candidate / Modality	Indication	Development Stage						
			Target Identification & Selection	Lead Discovery	Lead Optimization	IND-Enabling	Phase 1	Phase 2	Phase 3
ALS-1	Small molecule	Treatment of viral infections caused by Influenza virus A							
ALS-4	Small molecule	Treatment of bacterial infections caused by Staphylococcus aureus including MRSA							
NLS-1	Small molecule	Treatment of Endometriosis							

ALS-1 for treatment of viral infections caused by influenza A virus

ALS-1 (nucleozin) is a small molecule drug candidate being developed as an orally-administered treatment for influenza A virus by acting on a novel target, viral nucleoproteins. Nucleoprotein as a target for viral infections cause by the influenza A virus was discovered by Richard Kao, a professor at the University of Hong Kong and founder of Acticule. Acticule is an 80%-owned subsidiary of Aptorum which is leading development of their Acticule (i.e. 'ALS') series of molecules.

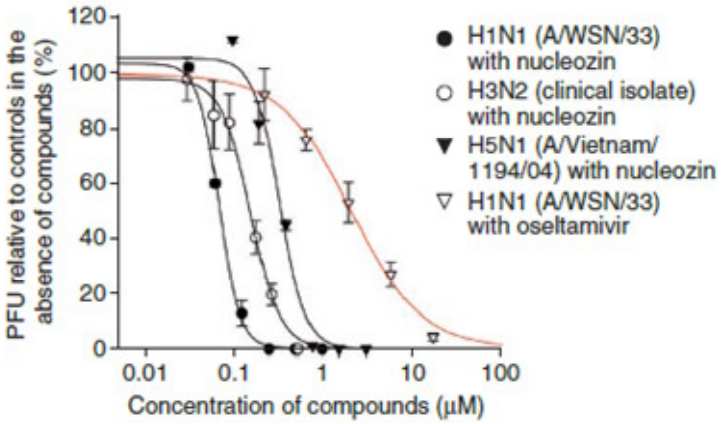
It is believed that influenza A nucleoprotein is essential for the virus to be able to proliferate. ALS-1 acts on influenza by aggregating nucleoprotein, thereby preventing their entry into the nucleus and inhibiting replication. ALS-1 is designed to have utility across a broad range of NP variants. This novel target and method action potentially affords a new treatment for influenza A virus, which becomes progressively more difficult to address due to its growing resistance to conventional drugs. Highly virulent and new strains pose particular concern that current influenza A therapies will prove ineffective, compounding the need for novel drugs. This concern became a reality during the 2008 – 2009 flu season when nearly all of the circulating influenza A viruses were resistant to Tamiflu (oseltamivir), which remains the most prescribed flu medication.

ALS-1, along with their other two lead programs (ALS-4 and NLS-1), are currently in what Aptorum characterizes as the '**Lead Optimization Stage'** which they define as…"In this stage of the drug discovery process, the aim is to produce a preclinical drug candidate by maintaining the desired and favorable properties in the lead compounds, while repairing or reducing deficiencies in their structures. For example, to optimize the chemical structures to improve, among others, efficacy, reduce toxicity, improve metabolism, absorption and pharmacokinetic properties." If all goes well, Aptorum hopes to file an investigational new drug application (seeking regulatory approval to begin human testing) for ALS-1 by 2020 or 2021.

Preclinical evidence shows ALS-1 impedes influenza A replication, protects mice from H5N1 (avian) flu…
Studies by Professor Richard Kao and his colleagues, which were published in June 2010 in the journal Nature Biotechnology[1], found that…

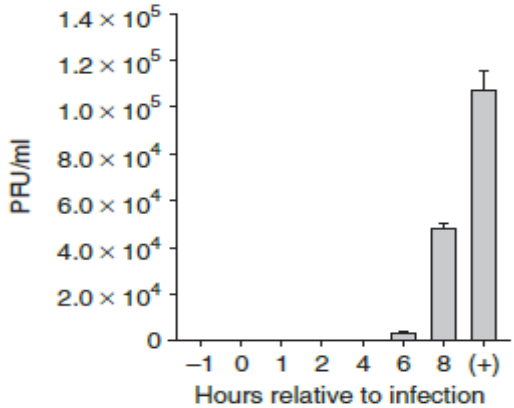
- ALS-1 inhibited infection of Madin-Darby canine kidney (MDCK) cells from the H1N1 (A/WSN/33), H3N2 (clinical isolate) and H5N1 (Vietnam/1194/04) viruses
- ALS-1 inhibited viral growth even when added up to six hours after inoculation of the MDCK cells. The chart, below right, shows the amount of plaque-forming units (a marker for in vitro efficacy against infectious viruses, with lower = better) after MDCK cells were infected with influenza virus (at 0 hr) and ALS-1 was added at -1 hr (i.e. one hour prior to infection) and at 1, 2, 4, 6 and 8 hrs. The chart shows that ALS-1 was effective against the virus even when administered six hours after infection. This is noteworthy as it suggests that, in addition to preventing NP entry into the nucleus, ALS-1 may interrupt other viral replicating processes as well
- ALS-1 ('nucelozin' in the chart below left) was more effective than oseltamivir (i.e. Tamiflu) in reducing the plaque-forming units of human H1N1 (i.e. influenza A) virus
- the IC_{50} (i.e. concentration of the drug at which one-half of the virus' maximum response is inhibited) of ALS-1 was lower (i.e. better) than that of oseltamivir against H1N1

ALS-1 outperforms Tamiflu in reduction of influenza virus



Source: Kao R. et al. Nature Biotechnology. June 2010

ALS-1 effective even when taken 6hrs post-infection

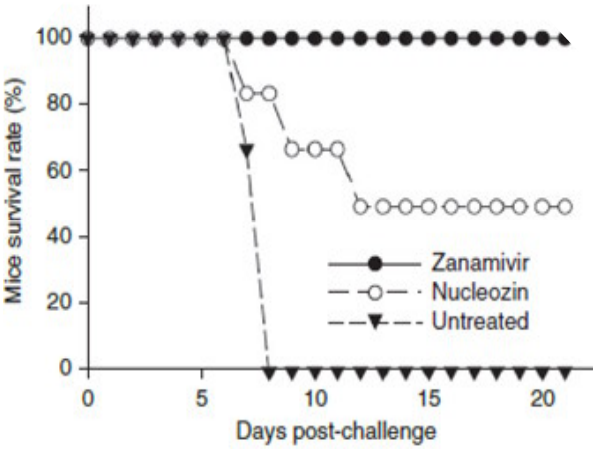


Source: Kao R. et al. Nature Biotechnology. June 2010

[1] Kao R., et al. Identification of influenza A nucleoprotein as an antiviral target. Vol 28, No. 6, June 2010 Nature Biotechnology

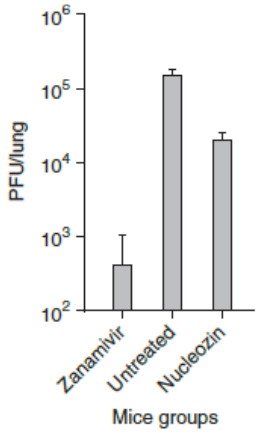
- in addition, an in vivo study showed that mice infected with highly pathogenic strain of avian influenza A H5N1 virus and treated with ALS-1 had a higher survival rate than treatment-free mice. Specifically, while all treatment-free mice died within seven days after infection, 50% of mice receiving two doses of ALS-1 per day for seven days survived for more than 21 days. In addition, mice that received either ALS-1 or zanamivir (i.e. Relenza) showed significantly lower viral load in the lungs (three mice in each group were euthanized at day 6 and dissected)

Pathogenic avian flu: ALS-1 mice lived longer than untreated



Source: Kao et al. Nature Biotechnology. June 2010

Lower viral load in ALS-treated vs untreated mice



Source: Kao et al. Nature Biotechnology. June 2010

ALS-1 Intellectual property status

Project Company / Project name	License Agreement	Licensor(s)	Licensee	Licensed / IP Rights	Patent Expiration Dates
Acticule / ALS-1	Exclusive Patent License Agreement, dated October	Versitech Limited	Acticule Life Sciences Limited	Exclusive licensee: 1 U.S. patent (US9212177), 1 European Patent (EP2462138B1), 1 PRC patent (CN102596946B), 1 German patent (DE60 2010 019 171.0)	The licensed IP rights include granted patents in the U.S., Switzerland, Germany, Great Britain and PRC.
	First Amendment to Exclusive License Agreement,				The U.S. patent will expire in 2031; the European Patent in 2030; the PRC patent in 2030 and the German patent in 2030.

Source: Aptorum

Market for Influenza Drug Therapy…

The potential target market for ALS-1 is represented by the three to five million cases of severe influenza that occur worldwide each year, which result in between 290k and 650k deaths. Driven in part by anticipated demand for novel therapies, industry experts forecast the global market for influenza drugs to double, from $600M in 2016 to $1.2B by 2025.

Influenza A viruses are categorized into subtypes by two specific proteins in the viruses; hemagglutinin (H) and neuraminidase (N). Among the 18 current influenza A subtypes, two are found in humans; H1N1 and H3N2. Influenza viruses undergo changes over time (i.e. antigenic drift and antigenic drift) which introduces risk that vaccines and antiviral drugs will be less effective in combating the viruses. Influenza viruses are also prone to acquiring resistance to antiviral drugs.

Current antiviral drugs; NA inhibitors and CEN inhibitors…

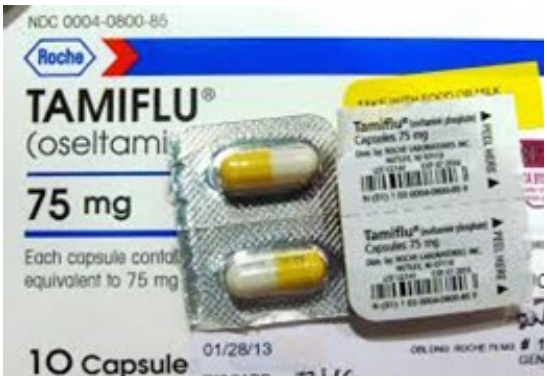
Only two classes of drugs are currently recommended by the U.S. Centers for Disease Control to treat the symptoms of influenza A virus in humans; neuraminidase (NA) inhibitors and cap-dependent endonuclease (CEN) inhibitors. A third class, adamantanes, are no longer recommended for use by the CDC against circulating influenza A due to widespread resistance to the drugs. NAs, and particular oseltamivir (Tamiflu), are the most commonly used antivirals.

As the name implies, NAs work by blocking the enzyme neuraminidase, thereby inhibiting its ability to spread throughout the body. In addition to Tamiflu (Roche) (OTC: RHHBY), the other FDA-approved NAs consist of

generic oseltamivir (FDA approved in 2016), Relenza (zanamivir) and Rapivab (peramivir). Relenza (NYSE: GSK), which is administered via an inhaler was approved in 1999 while Rapivab (BioCryst Pharm) (Nasdaq: BCRX), which is given intravenously, was approved in 2014.

Meanwhile, Xofluza (baloxavir), is the newest antiviral medication and the only currently approved CEN inhibitor. Xofluza (Roche / Shionogi) received FDA approval in October 2018. Xofluza works differently than NAs do. Instead of blocking neuraminidase (and thereby stopping the virus' spread in the body), CEN inhibitors inhibit an enzyme that acts to replicate the virus (thereby stopping the virus from multiplying).

Tamiflu, most prescribed influenza A drug



Source: abcnews

Xofluza, new class of antiviral approved Oct 2018

Source: klove.com

Acquired resistance necessitates novel influenza A antivirals…

The risk of antiviral resistance became a widespread reality during the 2009 flu season when nearly 100% of the globally circulating H1N1 virus were found to be resistant to NAs such as Tamiflu, which was and still is the most commonly prescribed antiviral drug therapy. The 2009 flu pandemic saw a rapid and global spread of the H1N1 virus and prompted the World Health Organization to declare their first-ever 'public health emergency of international concern'. An estimated 285k people died from the disease.

Despite the 2009 flu scare, little has changed in terms of antiviral drug therapy. NAs remain the most widely prescribed antiviral therapy and continue to be exposed to both acquired resistance as well as another outbreak of a new influenza A strain that lacks susceptibility to this class of drugs. And despite the relative popularity of NAs, they are associated with unpleasant side effects and there are questions about their clinical value. Side effects include vomiting, diarrhea, headaches and difficulty sleeping. As it relates to clinical utility, a 2014 Cochrane review found that treatment with oseltamivir does not reduce complications associated with influenza nor reduce hospitalizations. Meanwhile two meta analyses found that the benefits of using oseltamivir by otherwise healthy individuals is not outweighed by the risk and use in high risk populations is not associated with reduced risk of death. Tamiflu sales peaked at ~$3B annually, which was prior to the entry of generic oseltamivir.

While Xofluza represents another option, particularly for strains that are resistant to NAs, it too does not appear to be a panacea. There are already reports of resistance to the CEN inhibitor and of doctors curbing or altogether ceasing their prescribing of the drug. Analysts estimate that peak annual sales of Xofluza could eventually reach $1B.

ALS-4 for the treatment of Staphylococcus aureus bacterial infections, including MRSA

ALS-4 is a small molecule drug candidate being developed as an intravenously-administered treatment for bacterial infections caused by Staphylococcus aureus, including MRSA. MRSA has developed resistance to many previously effective antibiotics. But, unlike those treatments, ALS-4 employs a non-bactericidal approach. Similar to ALS-1, ALS-4 is currently in 'Lead Optimization' phase. Aptorum hopes to be in a position to commence phase 1 studies of ALS-4 in 2020.

Staphylococcus aureus (S. aureus) produces a number of virulence factors that contribute to its pathogenesis including certain proteins and enzymes that promote colonization and help to shield it from the body's immune system. The production of these virulence factors by bacterial genes is called 'virulence expression'. ALS-4 targets virulence expression, a novel approach to addressing bacterial infections and one that could mitigate the significant and growing threat of antibiotic-resistant bacteria.

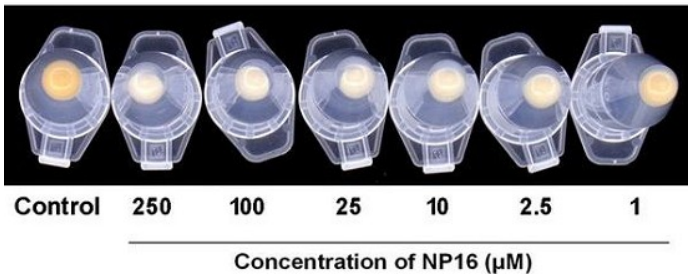
Specifically, ALS-4 targets an enzyme that is involved in the production of Staphyloxanthin, a carotenoid pigment which is produced by certain strains of Staphylococcus aureus. Staphyloxanthin is responsible for the Staphylococcus aureus's characteristic golden color and has been implicated in facilitating bacterial invasion and protecting it from death by evading reactive oxygen species and neutrophils (produced by the immune system). ALS-4 is being investigated as a novel inhibitor of S. aureus pigment production which, if effective, should render the pathogen susceptible to death by the body's immune system.

ALS-4 reduces survival of Staphyloxanthin in vitro…

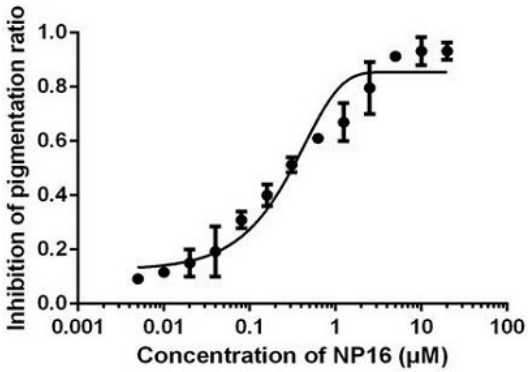
In vitro experiments conducted by Professor Richard Kao and colleagues from the University of Hong Kong and University of British Columbia demonstrated that ALS-4 effectively increased S. aureus's susceptibility to immune killing and clearance.[2] The investigators concluded that ALS-4 is "a novel druggable target in S. aureus and presents a potent and effective lead compound for the development of virulence factor-based therapy against S. aureus." These findings were published in the September/October 2017 issue of mBio and were the subject of the 1st Prize of the Innovation Academy Award at the 4th International Conference on Prevention & Infection Control that same year.

Results of these studies showed;[3]

- formation of the golden pigment was inhibited with increasing concentrations (i.e. analogous to dose-response) of ALS-4 (NP16 in the graphs and graphics below)

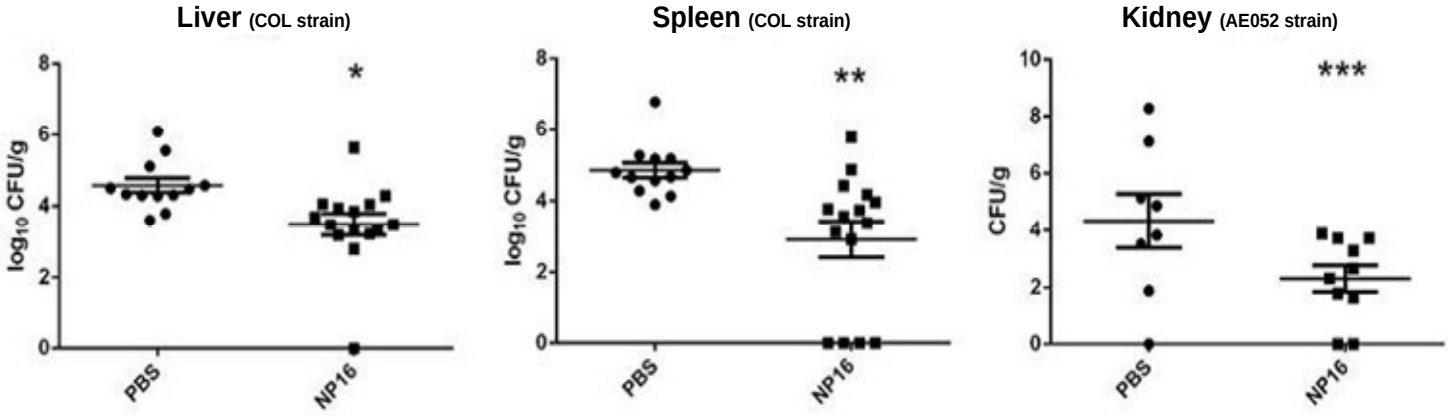


- IC_{50} of ALS-4 (i.e. concentration of ALS-4 where maximum pigmentation is reduced by 50%) was ~300nM



- Bacteria recovered from the livers and spleens of COL-infected mice treated with ALS-4 were compared to an untreated group (pbs is phosphate-buffered saline) 72 hours after infection. Results showed significantly lower bacterial counts in both the livers (p=0.0085) and spleens (p=0.0032) of the ALS-4 treated mice.
  Similarly, bacterial counts in the kidneys of AE052-infected mice were significantly lower (p=0.0465) in those treated with ALS-4 as compared to those who were not treated. Moreover, while bacterial counts were below the assay detection threshold in six of the ten treated mice, this was the case for only two of the ten untreated mice

[2] Gao P, Davies J, Kao RYT. 2017. Dehydrosqualene desaturase as a novel target for anti-virulence therapy against Staphylococcus aureus. mBio 8:e01224-17
[3] All graphs and graphics related to ALS-4 sourced from Davies et al. mBio. Sept 2017.



ALS-4 Intellectual property status

Project Company / Project name	License Agreement	Licensor(s)	Licensee	Licensed / IP Rights	Patent Expiration Dates
Acticule / ALS-4	Exclusive Patent License Agreement, dated October 18, 2017	Versitech Limited	Acticule Life Sciences Limited	Exclusive licensee: 2 pending U.S. applications (16/041,836 and US 16/041,838), and 2 pending PCT applications (PCT/IB2018/055458, PCT/IB2018/055459)[2]	The licensed IP rights include pending patent applications in the U.S. and under the PCT.
	First Amendment to Exclusive License Agreement, dated June 7, 2018				Any patent based on the application, if granted, will have a 20-year patent term from 2018.
	Exclusive Patent License Agreement dated January 11, 2019				

Source: Aptorum

Market for treatment of Methicillin-resistant Staphylococcus…

The majority of MRSA related cases happen in hospitals or other health care facilities. These infections are known as 'healthcare-associated MRSA' (HA-MRSA) and typically occur during invasive procedures such as surgeries or the placement of catheters or certain medical devices such as implants. HA-MRSA can also be spread by healthcare workers when they fail to clean their hands between treating different patients. HA-MRSA is caused by a certain Staphylococcus bacteria that has become resistant to many previously-effective antibiotics. HA-MRSA is a growing problem and currently accounts for more than 60% of total Staph infections. Symptoms of HA-MRSA can include surgical infections, urinary tract infections and bone and joint infections, among others. Severe HA-MRSA can result in pneumonia, bloodstream infections, organ failure and even death.

'Community-associated MRSA' (CA-MRSA) represents the second most common MRSA infection and typically occurs among healthy people. As approximately one-third of the U.S. population is believed carry MRSA on their skin or in their nasal passages (these people are 'colonized' but not infected), risk of acquiring CA-MRSA is usually highest in crowded environments and settings where contact with other people is commonplace. Symptoms of CA-MRSA typically start as small red bumps on the skin. If not addressed, these bumps can manifest into painful skin abscesses and eventually muscle aches, fatigue and shortness of breath. Left untreated, CA-MRSA can enter the bloodstream at which point an individual's health can become seriously compromised.

The potential U.S. market for ALS-4 is represented by the ~126k hospitalizations and 94k invasive infections associated with MRSA each year. Globally, approximately $3B is spent each year on MRSA-related drugs. As MRSA has become resistant to many antibiotics, there is a clear unmet need for novel therapies such as ALS-4 which employ a non-antibiotic approach.

ALS-4 may be eligible to follow FDA's new LPAD regulatory pathway…
In June 2018 the U.S. FDA published initial industry draft guidance for their new *Limited Pathway for Antibacterial and Antifungal Drugs* (LPAD), which provides sponsors (potentially such as Aptorum) with a new, expedited regulatory route for the approval of novel antibacterial and antifungal drugs. LPAD is part of the new 21st Century Cures Act aimed at streamlining regulatory approval of drugs and medical devices targeting rare diseases and unmet medical needs.

The rationale for LPAD was to encourage the development of novel drugs that will address the growing problem of drug-resistant bacteria which, per the draft guidance, "is a critical public health and patient care concern." LPAD is restricted only for drugs that are intended to treat a serious or life-threatening infection in limited population of patients with unmet needs. It was designed to address many of the unique difficulties associated with conducting clinical trials for antibacterial drugs and includes special provisions aimed at addressing those challenges.

Among these are allowances for smaller clinical trial populations (as compared to traditional drug trials), significant consideration of pharmacokinetic/pharmacodynamic and non-clinical trial data (such as animal models) and primary support via a single non-inferiority trial. In addition, sponsors can still seek other expedited designations such as accelerated approval, priority review, etc.

While it is too early to know whether ALS-4 (as well as their other 'ALS' programs including ALS-2 and ALS-3 – see below) would be eligible for the LPAD pathway, it potentially eventually provides Aptorum with an accelerated route to the U.S. commercial market. We also think it sends a clear signal that FDA supports and encourages novel antibacterial drug development, which in and of itself, may provide for ancillary benefits to drug developers.

NLS-1, a derivative of a molecule extracted from green tea, for the treatment of Endometriosis
NLS-1 is a small molecule drug candidate being developed as a novel orally-administered treatment for endometriosis. NLS-1 is a drug molecule derived from epigallocatechin-3-gallate, a small molecule extracted from green tea. Endometriosis is a condition whereby tissue that normally only lines the uterus also grows on the outside of it (typically the pelvic area). While it is can sometimes be managed with hormonal treatments, pain medication and/or surgery, a cure for the disease does not currently exist.

Epigallocatechin-3-gallate (EGCG) has been well studied in preclinical models as a potential anti-angiogenesis therapy for endometriosis. In vitro and animal studies have shown promise in that regard including the ability of EGCG to;
- significantly reduce the number and volume of endometriosis lesions[4]
- significantly reduce cell proliferation and vascular density and increase apoptosis of the lesions
- reduce endometrial epithelial cell proliferation
- prevent progression of fibrosis of endometriosis[5]

Despite the promising preclinical results, significant further development has been hampered by the molecules relatively instability and low bioavailability.[6] This has created an opportunity for EGCG derivatives such as NLS-1, development to-date of which has suggested potentially similar efficacy to EGCG but without the same drawbacks.

Similar to EGCG, NLS-1's method of action relies on anti-angiogenesis – that is, inhibiting the ability of lesions to form new blood, thereby stopping their growth. Preclinical research to-date suggests that NLS-1 does indeed inhibit lesion growth and may do so without suffering from the same challenges as ECGC. In fact, evidence suggests that NLS-1 may actually be a more effective anti-angiogenesis than ECGC.

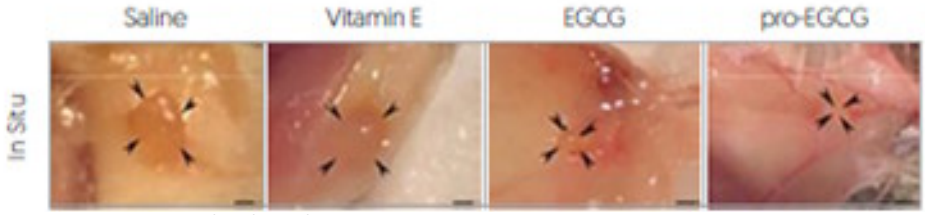
NLS-1 inhibits endometriosis lesion growth without bioavailability challenges…
Preclinical evidence of the potential utility of NLS-1 in treating endometriosis was published in the journal Angiogenesis in 2013. An endometriosis mouse model showed that;[7]

- NLS-1 was associated with statistically greater reduction in the size and weight of lesions as compared to both ECGC and control (i.e. no treatment) cohorts. Moreover, there were no significant safety issues (in any of the cohorts) with mice showing no signs of stress or toxic responses to the respective administered treatments.

[4] Ricci AG, et al. Natural therapies assessment for the treatment of endometriosis. Hum Reprod. 2013 Jan;28(1):178-88. doi: 10.1093/humrep/des369. Epub 2012 Oct 18.
[5] Matsuzaki S, Darcha C. Antifibrotic properties of epigallocatechin-3-gallate in endometriosis.Hum Reprod. 2014 Aug;29(8):1677-87. doi: 10.1093/humrep/deu123. Epub 2014 May 29
[6] Matsuzaki S, Darcha C. Antifibrotic properties of epigallocatechin-3-gallate in endometriosis.Hum Reprod. 2014 Aug;29(8):1677-87. doi: 10.1093/humrep/deu123. Epub 2014 May 29.
[7] All charts, pictures, graphics and discussion sourced from Wang CC, et al. Prodrug of green tea epigallocatechin-3-gallate (Pro-EGCG) as a potent anti-angiogenesis agent for endometriosis in mice. Angiogenesis (2013) 16:59–69

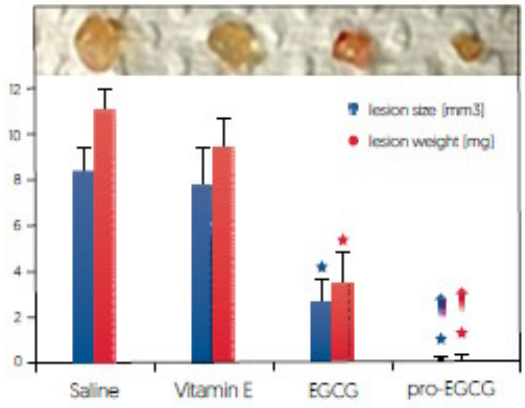
In the study, endometrium were subcutaneously implanted into the abdominal wall of mice, which received intraperitoneal injections of either saline (control), vitamin E, EGCG or NLS-1 (i.e. pro-EGCG). Four mice per cohort. Growth of the implants was monitored and angiogenesis of the lesions measured. The arrows in each of the four pictures below indicates the respective size of each of the lesions – note that the pro-EGCG (NLS-1) lesion is the smallest.

NLS-1 inhibits growth of endometriosis lesion in mice

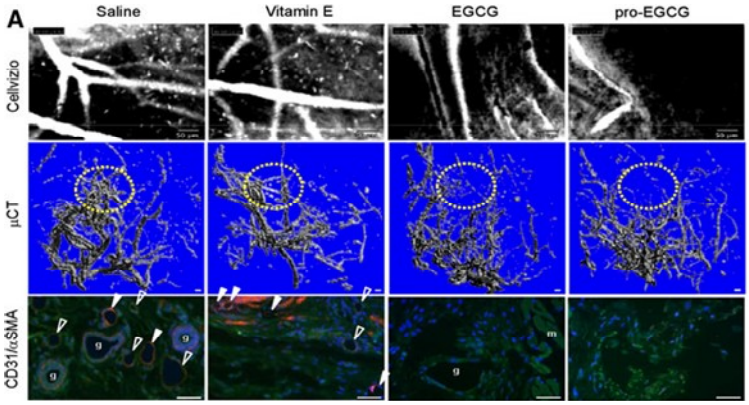


Source: Wang, et al. Angiogenesis. 2013

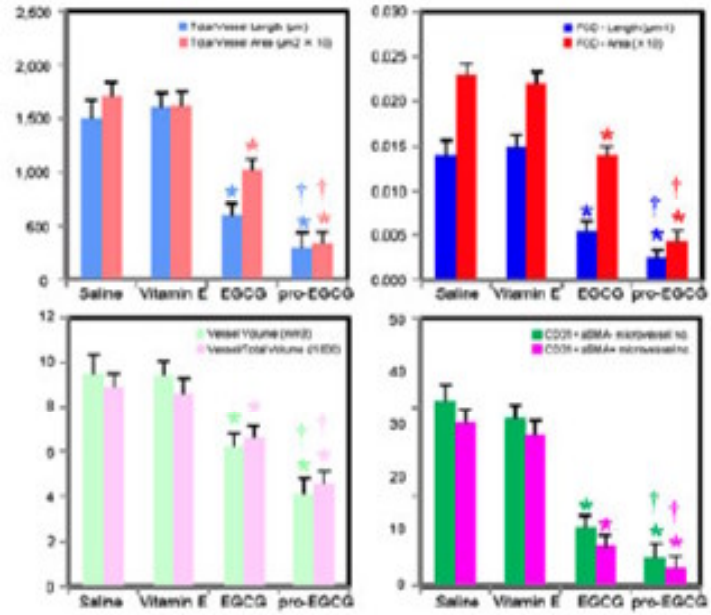
- Lesion size as illustrated in bar chart below. NLS-1 treated lesion was significantly smaller than those administered with saline ($p<0.05$) and EGCG ($p<0.05$)



- Inhibition of microvessel growth and architecture of the lesions was also greatest among the NLS-1 treated mice

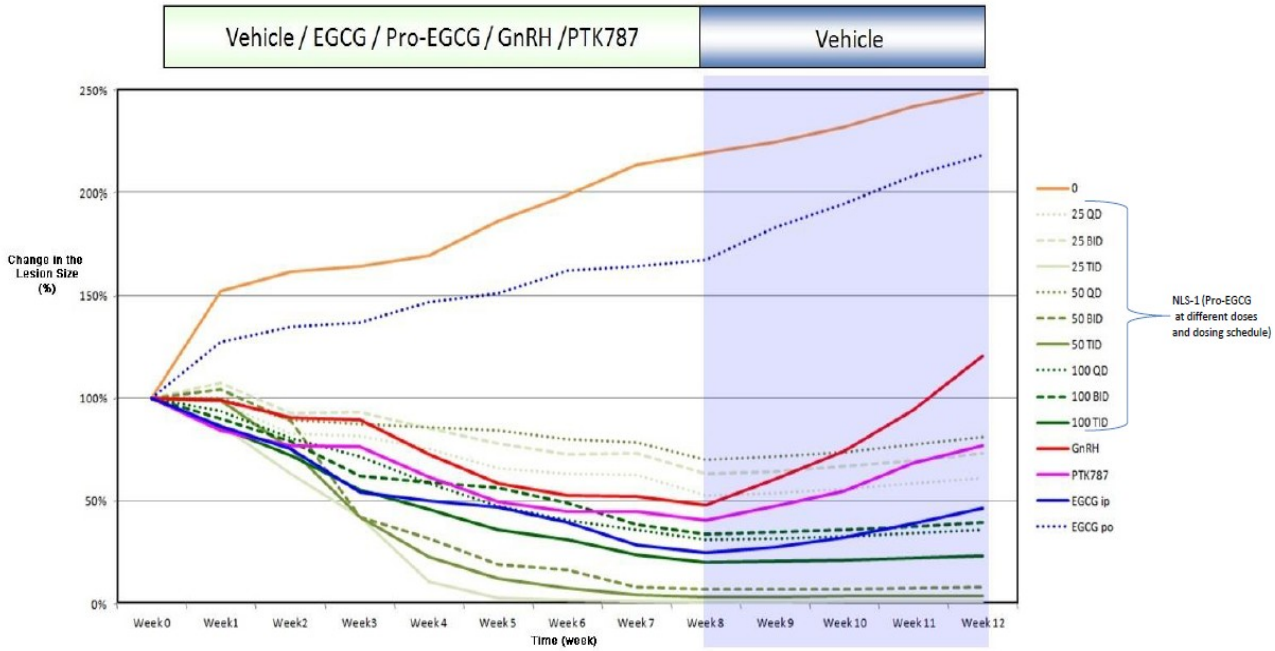


Upper panels: Microvessels in the endometriotic implants were perfused with FITC-Dextran and captured by Cellvizio (white colour). Middle panels: Microvessel architectures surrounding the lesions and within the lesions were perfused with microfil contrast medium and captured by ICT (yellow dots). Lower panels: Microvessels in the endometriotic lesions were determined by specific antimouse antibodies CD31 for endothelial cells in red, aSMA for smooth muscles in green, and DAPI for nuclei in blue. New microvessels are CD31-positively and aSMA-negatively stained (closed arrows), old microvessels are CD31-positively and aSMA-positively stained (opened arrows). g: endometrial glands; c: endometrial cyst-like structures; m: abdominal muscle. Representative images in different groups are shown.



Bar charts of the lesion microvessel parameters in different groups are presented. Mean ± -SEM, student's t test, *P<0.05 compared with saline group; P<0.05 compared with EGCG group

A follow-up study (results in chart below) was conducted with orally-administered NLS-1 which further supported the superiority of the molecule in reducing lesion size as compared to other therapies including EGCG ($p<0.05$) and other hormone-based therapies such as intramuscular GnRH analog ($p<0.05$) and other synthetic anti-angiogenesis agents such as intraperitoneal PTK787 ($p<0.05$)



NLS-1 Intellectual property status

Project Company / Project name	License Agreement	Licensor(s)	Licensee	Licensed / IP Rights	Patent Expiration Dates
Nativus / NLS-1	1) Exclusive License Agreement, dated July 3, 2017	1) PolyU Technology and Consultancy Company Limited	Aptorum Therapeutics Limited	Exclusive licensee: 6 U.S. patents (US9713603, US7544816, US8193377, US8710248, US9169230, US10188629), 1 European Patent (EP1778663), 1 PRC patent (CN101072764B), 1 Indian patent (IN263365) and 1 Japanese patent (JP5265915), as well as 1 pending U.S. application (US16/259,620), 1 pending PRC application (CN104703596A), and 1 pending Hong Kong application (HK15111955.3)	The licensed IP rights include granted patents in the U.S., Germany, Great Britain, France, Italy, Spain, PRC, India and Japan, as well as pending patent applications in the U.S., PRC and Hong Kong. We cannot predict whether such future patent applications will result in the issuance of patents that effectively protect the candidate.
	2) Addendum to License Agreement, dated February 9, 2018	2) McGill University			The U.S., European and PRC patents covering the compound will expire in 2025; the indication U.S. patent will not expire until 2033.
		3) Wayne State University 4) H. Lee Moffitt Cancer Center and Research Institute Inc. 5) The Chinese University of Hong Kong			

Source: Aptorum

Market for Endometriosis Treatment…

Approximately one in ten women of reproductive age will suffer from endometriosis. This puts the potential market for NLS-1 at approximately 176M women globally, including seven million in the U.S. Endometriosis is one of the

top three causes of infertility, with up to 50% of women afflicted with the disease unable to get pregnant. Endometriosis also commonly causes chronic, and sometimes severe, pelvic pain. While it is can sometimes be managed with hormonal treatments, pain medication and/or surgery, a cure for the disease does not currently exist.

Even current advancements in endometriosis therapies only address the symptoms of the disease. This includes elagolix (Orilissa), the first orally-administered gonadotropin-releasing hormone (GnRH) antagonist which received FDA approval in July 2018 for moderate to severe endometriosis pain. If eventually approved for use, NLS-1 could be the first and only therapy that addresses the underlying causes of endometriosis. In addition, as it is non-hormonal, it would not be associated with the related side effects which can include hot flashes, fatigue, depression and others. Aptorum hopes to have an IND prepared and filed for NLS-1 by 2020 or 2021.

Other Programs

In addition to their three lead candidates, Aptorum has several other, mostly earlier-stage, therapeutic programs underway that similarly focus on unmet clinical needs. These include a next-generation small molecule targeting Staphylococcus aureus (including MRSA), programs related to both the diagnosis/imaging and treatment of Alzheimer's disease, an extract from Chinese Yam targeting menopausal symptoms and a derivative from Ephedra paychyclada for the treatment of liver cancer, among others.

For reference, along with 'Lead Optimization Stage' (the stage which Aptorum's three lead candidates are in), the company characterizes earlier preclinical development as the following stages, in order of maturity (sourced from their IPO registration statement);

- **'Target Identification & Selection':** "The target is the naturally existing cellular or modular structure that appears to have an important role in a particular disease pathway and will be targeted by the drug that will subsequently be developed. Target validation techniques for different disease areas can be very different but typically include from in vitro and in silico methods through to the use of whole animal models."
- '**Lead Discovery Stage':** "Following "Target Identification & Selection," compound screening assays are developed as part of the Lead Discovery. 'Lead' molecules can mean slightly different things to different researches or companies, but in this Registration Statement, we refer to Lead Discovery as the process of identifying one or more small molecules with the desired activity against the identified targets. Leads can be identified through one or more approaches, which can depend on the target and what, if any, previous knowledge exists."
- **'Lead Optimization':** (ALS-1, ALS-4 and NLS-1) "In this stage of the drug discovery process, the aim is to produce a preclinical drug candidate by maintaining the desired and favorable properties in the lead compounds, while repairing or reducing deficiencies in their structures. For example, to optimize the chemical structures to improve, among others, efficacy, reduce toxicity, improve metabolism, absorption and pharmacokinetic properties."
- **'IND-Enabling Studies:'** "Includes all the essential studies such as GLP toxicology studies, pharmacology and efficacy, pharmacokinetics, in vitro metabolism, CMC studies, and the data of which are used for IND submission."

The following descriptions of Aptorum's non-lead programs is sourced directly from their recent public filings including the amended annual report filed April 22, 2019;

VLS-1: Curcumin-conjugated superparamagnetic iron oxide nanoparticles (Curcumin-MNP) for MRI imaging of amyloid beta plaques in Alzheimer's disease

"VLS-1 is an MRI contrast agent, which the Company believes may enable superior imaging for identifying amyloid beta plaques in Alzheimer's disease. VLS-1 differs from other existing contrast agents for amyloid imaging, such as Amyvid (Eli Lilly), Vizamyl (GE Healthcare) and Neuraceq (Piramal Healthcare), in the following respects: 1) utilization of a natural compound, curcumin, with a known high amyloid beta binding affinity and proven safety; 2) a nanoparticle-based system to enhance delivery efficiency to the brain; and 3) the combination of curcumin with iron oxide, known to be an effective MRI contrast agent. VLS-1 is currently at the Lead Discovery stage."

VLS-2: mTOR-independent transcription factor EB activator (MITA) as autophagy activator for treatment of neurodegenerative diseases

"Autophagy is an endogenous cellular mechanism for clearing multiple pathological protein aggregates including tau, the presence of which is believed to account for neurodegeneration in AD and other neurodegenerative diseases. mTOR is part of a biological pathway that is a central regulator of mammalian metabolism and physiology. Inhibition of mTOR activity is associated with various side effects, such as immunosuppression. Many

other molecules that activate autophagy also inhibit mTOR activity. VLS-2 is a small drug molecule that appears to activate autophagy without inhibiting mTOR function. VLS-2 is currently at the Lead Discovery stage."

VLS-4: Other contrast agents for MRI diagnostics
"In addition to VLS-1, the Company is actively developing a new class of MRI contrast agents for diagnosis of neurodegenerative diseases. The design of these agents takes into consideration the physicochemical properties that need to be optimized for best imaging performance, and the novel agents are currently undergoing rigorous evaluation. VLS-4 is currently at the Lead Discovery stage."

ALS-2: Small molecule for the treatment of bacterial infections caused by Staphylococcus aureus including MRSA
"ALS-2 is a next generation small molecule targeting bacterial virulence for the treatment of bacterial infections caused by Staphylococcus aureus including MRSA. In a recent paper published by the inventor, Professor Richard Kao from The University of Hong Kong (also the Founder and Principal Investigator of Acticule), in PNAS (115(310: 8003, 2018), ALS-2 suppresses the expression of multiple virulence factors in Staphylococcus aureus simultaneously. In a lethal infection mouse model, compared with the vehicle group, ALS-2 protected against Staphylococcus aureus for all the mice in the group, with significant differences between the treatment and control groups [P = 0.0057, by log-rank (Mantel-Cox) test]. ALS-2 is currently at the Lead Optimization stage to optimize its drug-like properties."

ALS-3: Small molecule acting synergistically with certain existing antibiotics
"ALS-3 is a novel small molecule that is at present under investigation to combine with certain classes of existing antibiotics to overcome drug resistance. We are exploring ALS-3 for the treatment of bacterial infections including MRSA. ALS-3 is currently at the Lead Optimization stage to optimize its drug-like properties."

NLS-2: An extract from Chinese Yam for relief of menopausal symptoms
"NLS-2 is an extract isolated from Chinese Yam, Dioscorea opposita Thunb. In development for the treatment of menopausal syndrome, we expect NLS-2 is to be formulated into an oral dosage form or nasal spray for administration. Each therapy cycle is expected to last for 3 months. Menopausal syndrome refers to the symptoms experienced by women during menopause, such as hot flashes, mood disorders, night sweats, depression, nervous tension and insomnia that are related to estrogen deficiency. Our research suggests that NLS-2 stimulates estradiol biosynthesis in rat ovarian granulosa cells; induces estradiol and progesterone secretion in aged rats by upregulating expressions of follicle-stimulating hormone receptor and ovarian aromatase; counteracts the progression of osteoporosis and augments bone mineral density; and improves cognitive functioning by upregulating protein expressions of brain-derived neurotrophic factor and TrkB receptors in the prefrontal cortex. Furthermore, NLS-2 does not appear to stimulate the proliferation of breast cancer and ovarian cancer cells, which suggests that it could be a more efficacious and safer alternative to hormone replacement therapy (Sci Rep. 2015 5:10179). NLS-2 is currently at the Lead Discovery stage. We are also evaluating whether the yam extract is suited for production as dietary supplement."

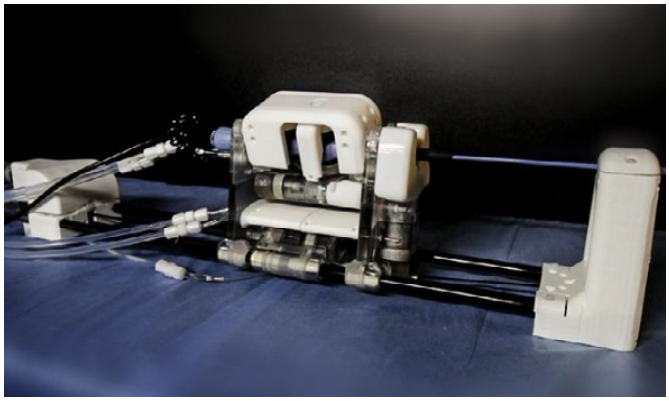
NLS-3: Extract from garlic for the treatment of and protection against retinal ischemia/reperfusion injury
"NLS-3 is based on S-Allyl L-Cysteine ("SAC"), an active organosulfur compound in aged garlic extract which has been reported to possess antioxidative activity. In macrophages and endothelium, it has been shown that SAC possesses potent antioxidative effects involving the scavenging of superoxide radicals, hydroxyl radicals and hydrogen peroxide. Central/branch retinal artery/vein occlusion, glaucoma and, possibly, age related macular degeneration ("AMD") are conditions associated with retinal ischemia. All these diseases may lead to severe complications or after-effects. Furthermore, after retinal ischemia/reperfusion ("I/R"), large amounts of reactive oxygen species ("ROS") are produced, which attack nearby cells and cause tissue damage. Therefore, management of retinal ischemia is vital and NLS-3 is being developed for the treatment of and protection against ischemia/reperfusion injury. NLS-3 is currently at the Lead Discovery stage."

SPLS-1: A quinoline derivate for liver cancer treatment
"SPLS-1, a novel quinoline derivative from Ephedra pachyclada, is at present under active investigation for the treatment of liver cancer. It is currently at the Lead Discovery stage."

The company also has a non-therapeutics segment which encompasses;

- **Development of surgical robotics and medical devices**, which is operated through their Signate Life Sciences Limited subsidiary. The initial project, named SLS-1, is a robotic catheter platform for intraoperative MRI-guided cardiac catheterization. Given the potential for a less rigorous regulatory pathway with medical devices (as compared to drugs and biologics), the time-to-market for SLS-1, if successfully developed, could be faster than the company's therapeutic candidates.

  SLS-1 robotic catheter

  Source: Aptorum

  Per the company's public filings describing SLS-1, it "is our robotic catheter platform for MRI-guided cardiovascular intervention for the treatment of arrhythmia. The platform consists of a magnetic resonance imaging ("MRI-guided") robotic electrophysiology ("EP") catheter system, an MR-based positional tracking unit, and a navigation interface. This platform has the potential to offer a major step toward achievement of several clinical goals: (i) enhancing catheter manipulation and lesion ablation, which we believe will decrease the chance of arrhythmia recurrence; (ii) improving the safety of catheter navigation, thereby decreasing the rates of undesired or inadvertent tissue damage; and (iii) enhancing catheter control, thus facilitating shorter learning curves for surgeons and better treatment in more complex patient cases. Should such goals be demonstrated, patient outcomes should be improved, compensating for the cost of using MRI and reducing the overall expenditure. To date, a product prototype has been developed. Lab-based experiments have been conducted to verify the performance of the robot towards an image-guided pulmonary vein isolation ("PVI") task. The MR-based tracking unit has also been developed and validated in MRI scanners. The next step is to test the robotic catheterization using a dynamic heart phantom simulated with the pulsatile liquid flow. Preclinical trials can then be conducted with all the components ready. RF ablation will be conducted in a live porcine model, prepared with arrhythmia. If all the results are positive, we will approach the US FDA or other regulatory agencies to apply for conducting clinical trials on the equipment. SLS-1 is currently in Lab-based Phantom Trial…"

- **An outpatient clinic**, which is operated through their Aptorum Medical Limited (AML) subsidiary. The clinic's initial focus is the treatment of chronic diseases associated with sedentary lifestyles. Aptorum expects that their AML Clinic, which began operations as 'Talem Medical' in June 2018, to reach operating profitability within 18 months of operating at full capacity. AML sales, however, are not expected to be sufficient enough to fully fund the company's other projects.

  Per the company's filings describing AML, "Incorporated in August 2017, Aptorum Medical Limited is a Hong Kong-based company incorporated in Cayman Islands focused on delivering premium healthcare and clinic services. AML can draw on the expertise of many of the region's most experienced medical practitioners, and is committed to providing a comprehensive cross-functional facility for healthcare professionals to practice evidence-based medicine and offer high-quality medical services to their patients. We also intend that AML will offer to conduct clinical trials of both the Company's and third parties' new drug and device products. Effective as of March 2018, we leased office space in Central, Hong Kong, the commercial and financial heart of Hong Kong, as the home to AML Clinic (See "Facilities"). We operate the AML Clinic under the name of Talem Medical. AML Clinic commenced operation in June 2018. The recently renovated medical center is staffed by our group of medical professionals and offers state-of-the-art facilities. Initially we expect to focus our expertise on treatment of chronic diseases resulting from modern sedentary lifestyles and an aging population."

The company further diversified their shots on goal with three significant announcements in Q2 2019;

- in April they announced an agreement with Aeneas Capital Limited and A*ccelerate Technologies Pte Ltd., to co-fund healthcare and technology start-ups in Singapore over the next five years. The companies anticipate investing $90M to create up to 20 new healthcare-focused ventures. A*ccelerate is Singapore's enterprise office of the Agency for Science, Technology and Research (A*STAR). The partners expect to have a hands-on approach, leveraging their expertise, resources and contacts to help nurture and increase the likelihood of success of these start-ups.

  The April 24, 2019 press release announcing the agreement notes that one of the initial areas of focus may be leveraging A*STAR's capabilities in medical imaging and translating that into 2D and 3D MRI solutions for surgical robotics. As noted above, Aptorum also has expertise in surgical robotics. Combined imaging and surgical robotics is a significant growth area in medical technology as it offers the potential to speed overall diagnostic and procedure time, reduce provider and facilities costs and improve overall patient outcomes.

Aptorum and Aeneas Capital will also be launching a (up to) $200M healthcare and life science strategic investment fund.

- also in April Aptorum announced the establishment of Smart Pharma, a new subsidiary. Smart Pharma (SmartP) will operate “Smart-ACT”, which Aptorum notes is its “its novel computational repurposed drug discovery, modeling and validation platform.” Smart-ACT” is an acronym for Accelerated Commercialization of Therapeutics and, per the April press release, “encompasses state-of-the-art technology in systematic screening of existing approved drug molecules against selected therapeutic targets. Specifically, the Smart-ACTTM platform comprises of a network of modules and processes that simulate the effectiveness of drug molecules against diseases for outcome prediction and selection.”

  APM anticipates that the subsidiary will initially focus on the evaluation of molecules for orphan and other under-served disease. The aim is to identify up to 10 repurposed drug candidates per year. To-date the platform has screened more than 1,600 compounds related to three therapeutic target proteins which have been implicated as associated with poor prognosis of neuroblastoma. Smart-ACT has already identified several repurposed drugs (development of which can typically be relatively accelerated given already well-established safety, PK and PD profiles) that could potentially have utility against certain unmet disease categories. Next-steps, per the PR, are to conduct additional in vitro and in vivo validation work.

  Concurrent with the announced establishment of Smart Pharma, APM reported the launch of ‘Smart Pharma token’ (SMPT). SMPT, a token backed by the IP and future proceeds from the licensing/sale of drugs created through the Smart-ACT program, was jointly developed with blockchain company, Aenco. The SMPT token will not be available for sale to U.S. residents. APM expects to establish a secondary market for the token in the near-term.
- in May Aptrorum announced the establishment of Claves Life Sciences Limited, a subsidiary focused on the role of gut microbiota on major diseases such as metabolic diseases, cardiovascular disease, cancer, neurodegenerative diseases and others.

LEADERSHIP[8]

Management –

Mr. Ian Huen
Founder, Chief Executive Officer and Executive Director
Mr. Ian Huen is the Founder, Chief Executive Officer and Executive Director of Aptorum Group Limited. Mr. Huen is also the Co-Founder of a Hong Kong company, AENEAS CAPITAL LIMITED, a licensed corporation regulated by the Hong Kong Securities & Futures Commission as a Type 9 Asset Manager, since 2005. He has over 15 years of global asset management experience and previously covered the U.S. healthcare sector as an equity research analyst at Janus Henderson Group plc (formerly known as Janus Capital). Mr. Huen was the financial advisor in the sale of Seng Heng Bank Limited (Macau) to Industrial and Commercial Bank of China in 2007 and was appointed as the vice president of the Board of General Meeting in Industrial and Commercial Bank of China (Macau) Limited in March 2007 for a term of 12 years until March 2019.
As a trustee board member of the Dr. Stanley Ho Medical Development Foundation, Mr. Huen facilitates advisory, development funding, access to research resources across Asia and continues to establish relationships with leading academic institutions to propel innovations in healthcare.
Mr. Huen graduated from Princeton University with an A.B. degree in Economics in June 2001, earned a MA in Comparative and Public History from CUHK in June 2016. Mr. Huen is also a Chartered Financial Analyst ("CFA").

Mr. Darren Lui
President, Chief Business Officer and Executive Director
Mr. Lui is also an Executive Director and Co-Founder of AENEAS CAPITAL LIMITED, a licensed corporation regulated by the Hong Kong Securities & Futures Commission as a Type 9 Asset Manager.
Mr. Lui was previously the founder, director and responsible officer of Varengold Capital Securities Limited and Varengold Capital Asset Management Limited in Hong Kong, with subsidiaries operating brokerage, asset management, and investment businesses in Asia established since January 2015.
Prior to this, he was a Director within the Fixed Income Group of Barclays Capital, where he spent over nine years from September 2005 to February 2014 developing and establishing their London, Singapore and New York structuring teams. From September 2002 to August 2005 he was qualified as a Chartered Accountant with Ernst & Young LLP (London), specializing in capital markets advisory.
Mr. Lui graduated with First-Class Honors from Imperial College, London with a BSc degree in Biochemistry in June 2002. He is a Chartered Accountant (ICAS), a CFA, and an Associate of Chartered Institute of Securities & Investments (UK).

Dr. Clark Cheng
Chief Medical Officer and Executive Director
Prior to this appointment, Dr. Cheng served as the Operations Director since 2009 of Raffles Medical Group, and the company's Deputy General Manager since 2011, representing an expanded role in the region. During his employment with Raffles Medical Group, he practiced as a full-time medical administrator to overlook Raffles Medical Hong Kong operations and supported its development in the PRC.
Dr. Cheng received his medical training at the University College London, UK, in 2005 and completed his foundation year training at The Royal Free Hospital in 2007. Pursuing his career in surgery, he obtained his membership of the Royal College of Surgeons of Edinburgh in 2009 and commenced his training in Orthopaedics where he practiced as Specialist Registrar at the National University Hospital, Singapore, with special interest in Traumatology of the lower limbs. In 2011, he also obtained his Master in Business & Administration with distinction from Tippie College of Business, University of Iowa, US.
Dr. Cheng is an active member of the Singapore Chamber of Commerce, and appears regularly as a guest speaker for The Open University of Hong Kong, The Airport Authority Hong Kong and other corporate events.

Miss Sabrina Khan
Chief Financial Officer
Miss Khan leads the Company's financial strategy and operations, as well as Investor Relations. She has extensive experience working at KPMG (Hong Kong) and Ernst & Young LLP (Hong Kong). She was recently the regional financial controller in Asia for St. James's Place Wealth Management (Hong Kong), which St. James's Place Wealth Management Group (LON: STJ) is a FTSE100 company with £89.9 billion of client funds under management. Prior to that, she served as the senior finance manager of Neo Derm Group, a leading medical aesthetic group in Asia, in charge of its finance-related matters and expansion in the PRC. From August 2009 to May 2013, she served as the senior finance manager of Global Cord Blood Corporation (formerly known as China Cord Blood Corporation (NYSE: CO)), which was a subsidiary of Golden Meditech Holdings Limited (HK: 801), where she played an important role with the NYSE listing filings, investor relations and post IPO reporting. During her employment with Global Cord Blood Corporation, she was actively involved in the issuance of convertible bonds to Kohlberg Kravis Roberts and various merger and acquisition projects, facilitated and liaised with investment banks on due diligence, deal structuring, and also involved in commercial negotiation with respect to major contract terms.
Miss Khan qualified as certified public accountant and graduated with a BBA (Hons) in Accounting & Finance at The University of Hong Kong in 2003. She was qualified as an Advanced China Certified Taxation Consultant in 2015.

[8] Per Aptorum's website

Dr. Thomas Lee
Chief Executive Officer and Chief Scientific Officer of Aptorum Therapeutics Limited
Dr. Thomas Lee is the Head of Research & Development of Aptorum Group Limited. He served as Chief Executive Officer and Chief Scientific Officer of Aptorum Therapeutics Limited, a wholly-owned therapeutics subsidiary of Aptorum Group Limited from January 2018 to March 2019. Prior to that, Dr. Lee served as an Assistant Professor in the School of Pharmacy, Faculty of Medicine, The Chinese University of Hong Kong from August 2013 to January 2018. Dr. Lee's key area of research involves drug delivery with specialties including: formulation development of poorly soluble compounds, oral delivery, Nanotechnology, and similar fields.
Prior to academia, Dr. Lee accumulated big-pharma experience from the decade he spent at two multinational pharmaceutical companies in the U.S. From November 2008 to July 2013, Dr. Lee worked at Celgene Corporation as a Senior Scientist of the Formulations Research & Development. From June 2003 to November 2008, Dr. Lee worked at Novartis Pharmaceuticals Corporation, as a Principal Scientist.
Dr. Lee graduated with B.Pharm. (Hons) Degree from The Chinese University of Hong Kong in December 1995 and received his Ph.D. in Pharmaceutical Sciences (Drug Delivery) from the University of Wisconsin-Madison in the U.S in May 2003.

Dr. Angel Ng
Chief Operating Officer
Dr. Angel Ng is the Chief Operating Officer of Aptorum Group Limited. She served as the Chief Operating Officer ("COO") of Aptorum Therapeutics Limited, a wholly-owned therapeutics subsidiary of Aptorum Group Limited from September 2017 to March 2019. During this time, Dr. Ng led Aptorum Therapeutics Limited and its subsidiaries' operations and business strategies. Dr. Ng has extensive experience in project management with Innovation and Technology government funds and academic institutions.
Since September 2016, Dr. Ng works as a Research Officer cum Project Manager at The University of Hong Kong ("HKU") in project management for various research projects including government funded project of novel medical device. During this time, Dr. Ng led the research team towards cadaveric trial for a novel soft robotics medical device and coordinated all research related agreements. During December 2014 to September 2015, Dr. Ng served as Project Manager at Hong Kong Science & Technology Parks Corporation ("HKSTP"), where she worked on technology transfer and commercialization for research and development projects through partnerships between local universities and the worldwide network and expertise of the Oxford University commercial arm. Dr. Ng also worked for The Chinese University of Hong Kong ("CUHK") as Project Manager from September 2007 to January 2009. She managed a HK$60M government funded R & D project with a team of specialists in CUHK where she kept close liaison with industry and government authorities. Dr. Ng was in the precision chemical machining industry from 2003 to 2007, where she managed the manufacturing team and business operations in PRC.
Dr. Ng serves as a Director of Tecford Trading & Technology Company Limited since December 2017. Dr. Ng graduated with a B.Sc (Hons) from Department of Chemistry at HKU in December 2002, received her M.Sc in Composite Materials from Imperial College London in November 2003 and obtained her Ph.D. in Mechanical Engineering from HKU in December 2015.

Independent Directors –

Mr. Charles Bathurst
Mr. Bathurst is an Independent Non-Executive Director of Aptorum Group Limited. He has over 40 years' experience of management and senior executive roles primarily in financial services. In 2011, he set up his own independent consultancy service, Summerhill Advisors Limited, advising on management structure, business development, financial reporting, internal audit controls and compliance to both emerging and multinational companies. Today he holds Non-Executive and Advisory board positions on fast-growing companies in healthcare, technology and financial services.
Prior to establishing Summerhill, he served as a Director for J.O. Hambro Investment Management from September 2008 to August 2011, where he oversaw the restructuring and commercialization a range of in-house investment funds. He was appointed to the management board and supervised reporting teams including Business development, accounting teams, regulatory reporting teams and internal controls.
From April 2004 to March 2008, Mr. Bathurst served in multiple roles at Old Mutual Asset Managers (UK), including being a member of the senior management team and head of international sales. Duties included business development, launching new investment funds, recruitment, establishing and supervision of regulatory and financial reporting teams, as well as ensuring compliance with funds' regulatory requirements and corporate governance standards.
Prior to this, Mr. Bathurst was an advisor to Lion Capital Advisors Limited from April 2003 to March 2004, and from June 2002 to March 2003 business development reporting to the board of management of LCF Rothschild Asset Management Limited.
From April 1995 to March 2002, Mr. Bathurst joined a newly formed alternative investment management team at Credit Agricole Asset Management, establishing the London Branch as the Managing Director in 1998.

He was responsible for the recruitment and development strategy for marketing, sales, investment, financial reporting, compliance and regulatory controls and investor relations.
Between the period of September 1989 and December 1994, Mr. Bathurst worked for GNI, the largest futures and options execution and clearing broker on the London International Financial futures Exchange, where he focused on marketing to European and Middle East financial institutions. In 1991, he joined a new management team to launch a series of specialist investment funds while serving as the Head of Sales and Product Development.
Mr. Bathurst graduated from the Royal Military Academy Sandhurst in November 1974 and commissioned into the British Army serving in the UK and Germany.

Dr. Mirko Scherer
Dr. Mirko Scherer is an Independent Non-Executive Director of Aptorum Group Limited. Dr. Scherer has been serving as the Chief Executive Officer at CoFeS China (formerly known as "TVM Capital China") in Hong Kong since March 2015. CoFeS China focuses on cross-border activities in the life science industry between China and the West. CoFeS China acts as a bridge between China and the West, assisting Chinese investors and pharmaceutical companies accessing western innovations, while collaborating with innovative life science companies from the West to enter the fast-growing China market.
Dr. Mirko Scherer has served on the Board of the Frankfurt Stock Exchange from 2005 to 2007 and has been a board member of the Stichting Preferente Aandelen QIAGEN since 2004. From August 2016 through July 2018, Dr. Scherer served as a Non-Executive board member of Quantapore Inc. and from April 2015 through September 2017, he was a director of China BioPharma Capital I, (GP).
Dr. Scherer is an experienced biotechnology executive and has led numerous financing M&A and licensing transactions, in both public and private markets, in Europe and the U.S. for over 20 years. He consulted MPM Capital for the period between July 2012 and December 2014. Dr. Scherer was also a co-founder and partner of KI Kapital from November 2008 to February 2014, a company which was specialized in providing consultation in life science industry.
Prior to working in the venture capital industry, Dr. Scherer co-founded GPC Biotech (Munich and Princeton, NJ) and served as the Chief Financial Officer from October 1997 to December 2007. GPC Biotech engaged in numerous pharmaceutical alliances with companies such as Sanofi Aventis, Boehringer Ingelheim, Altana (now part of Takeda), Yakult, and Pharmion (now part of Celgene). Over the past 20 years, Dr. Scherer has established an extensive network in the U.S., European, and China's biotechnology and venture capital industry. Prior to his time at GPC Biotech, Dr. Scherer worked as a consultant from May 1993 to June 1994 at the Boston Consulting Group.
Dr. Scherer earned a Doctorate in Finance from the European Business School in Oestrich-Winkel/Germany in 1998, a MBA from Harvard Business School in June 1996, and a degree in Business Administration from the University of Mannheim/Germany in February 1993.

Dr. Justin Wu
Dr. Justin Wu is an Independent Non-Executive Director of Aptorum Group Limited. He also has been serving as the Chief Operating Officer of CUHK Medical Centre since August 2018. He served as the Associate Dean (Development) of the Faculty of Medicine at CUHK from July 2014 to June 2018 and the Associate Dean (Clinical) of the Faculty of Medicine at CUHK from December 2012 to July 2014, and has been serving a Professor in the Department of Medicine and Therapeutics since 2009, also the Director of the S. H. Ho Center for Digestive Health, a research center specializing in functional gastrointestinal diseases, reflux and motility disorders, and digestive endoscopy. Active in research publications and assessments, Dr. Wu served as the International Associate Editor of American Journal of Gastroenterology ("AJG"), and Managing Editor of Journal of Gastroenterology and Hepatology ("JGH"). He is also the Secretary General of the Asian Neurogastroenterology and Motility Association ("ANMA"), and Secretary General of the Asia Pacific Association of Gastroenterology ("APAGE").
Dr. Wu has won a number of awards including the Emerging Leader in Gastroenterology Award by the JGH Foundation, and the Vice Chancellor's Exemplary Teaching Award at CUHK. Aside from his expertise in gastroenterology, Dr. Wu has an extensive interest in the development of Integrative Medicine in Hong Kong. He is the Founding Director of the Hong Kong Institute of Integrative Medicine, working closely with the School of Chinese Medicine to develop an integrative model at an international level. The institute aims at maximizing the strength of Western and Chinese medicine to provide a safe and effective integrative treatment to patients.
Dr. Wu served as a consultant and an advisory board member for Takeda Pharmaceutical, AstraZeneca, Menarini, Reckitt Benckiser and Abbott Laboratory. He earned his Bachelor of Medicine and Bachelor of Surgery Degree (1993), and his Doctor of Medicine Degree (2000) from CUHK. Additionally, he attained Fellowships of the Royal College of Physicians of Edinburgh and London in 2007 and 2012 respectively, Fellowship of the Hong Kong College of Physicians in 2002, Fellowship of the Hong Kong Academy of Medicine in 2002, and has been an American Gastroenterological Association Fellow since 2012.

Professor Douglas W. Arner
Professor Douglas W. Arner is an Independent Non-Executive Director of Aptorum Group Limited. He is the Kerry Holdings Professor in Law at the University of Hong Kong and one of the world's leading experts on financial regulation, particularly the intersection between law, finance and technology. At HKU, he is Faculty Director of the Faculty of Law's LLM in Compliance and Regulation, LLM in Corporate and Financial Law and Law, Innovation, Technology and Entrepreneurship (LITE) Programmes. He is a Senior Visiting Fellow of Melbourne Law School, University of Melbourne,

and an Executive Committee Member of the Asia Pacific Structured Finance Association. He led the development of the world's largest massive open online course (MOOC): Introduction to FinTech, launched on edX in May 2018, now with over 35,000 learners spanning every country in the world. From 2006 to 2011, he was the Director of HKU's Asian Institute of International Financial Law, which he co-founded in 1999, and from 2012 to 2018, he led a major research project on Hong Kong's future as a leading international financial center. He was an inaugural member of the Hong Kong Financial Services Development Council, of which he was a member from 2013-2019. Douglas served as Head of the HKU Department of Law from 2011 to 2014 and as Co-Director of the Duke University-HKU Asia-America Institute in Transnational Law from 2005 to 2016. He has published fifteen books and more than 150 articles, chapters and reports on international financial law and regulation, including most recently Reconceptualising Global Finance and its Regulation (Cambridge 2016) (with Ross Buckley and Emilios Avgouleas). The RegTech Book (forthcoming 2019, with Janos Barberis and Ross Buckley). His recent papers are available on SSRN at https://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=524849, where he is among the top 150 authors in the world by total downloads.
Douglas has served as a consultant with, among others, the World Bank, Asian Development Bank, APEC, Alliance for Financial Inclusion, and European Bank for Reconstruction and Development, and has lectured, co-organized conferences and seminars and been involved with financial sector reform projects around the world. He has been a visiting professor or fellow at Duke, Harvard, the Hong Kong Institute for Monetary Research, IDC Herzliya, McGill, Melbourne, National University of Singapore, University of New South Wales, Shanghai University of Finance and Economics, and Zurich, among others. Since March 1, 2018, Professor Arner is the Senior Regulatory & Strategic Advisor of AENEAS CAPITAL LIMITED, a licensed corporation regulated by the Hong Kong Securities & Futures Commission as a Type 9 Asset Manager.
He holds a BA from Drury College (where he studied literature, economics and political science) in 1992, a JD (cum laude) from Southern Methodist University in 1995, an LLM (with distinction) in banking and finance law from the University of London (Queen Mary College) in 1996, and a PhD from the University of London in 2005.

Advisors –

Dr. Nishant Agrawal
Dr. Agrawal, MD, has been serving as the Director of Head and Neck Surgical Oncology, and Professor of Surgery at The University of Chicago School of Medicine since October 2015. He is specialized in management of patients with benign and malignant tumors of the head and neck, and has been practicing Otolaryngology - Head and Neck Surgery, at The University of Chicago Medicine, and Center for Advanced Medicine, both in Chicago since 2009.
Dr. Agrawal's work has achieved international recognition in the field of head and neck surgical oncology, as well as head and neck cancer genetics. Under his leadership, a team of researchers completed a landmark study that examined the genome of head and neck squamous cell carcinoma. His team has published extensively in the genomic landscapes of major head and neck cancers, including esophageal squamous cell carcinoma, esophageal adenocarcinoma, medullary thyroid cancer, adenoid cystic carcinoma, and mucoepidermoid carcinoma. Dr. Agrawal then applied these findings to identify tumor DNA as a biomarker that improves cancer diagnostics in the saliva and plasma of patients with head and neck squamous cell carcinoma. His researches focus on the application of cancer genetics to design diagnostic approaches to reduce morbidity and mortality from head and neck cancer.
In addition to his clinical and research contributions, Dr. Agrawal is an accomplished educator-teaching medical students, residents, and fellows about the management of patients with head and neck cancer. Prior to joining the University of Chicago, Dr. Agrawal was an associate professor at Johns Hopkins University, where he completed his medical training in 2001, followed by internship and residency.
In addition, Dr. Agrawal was granted fellowships from the Memorial Sloan Kettering Cancer Center, New York (Head and Neck Surgical Oncology), and from Johns Hopkins University School of Medicine, Baltimore (Molecular Genetics). He holds numerous Memberships from accredited American medical associations and institutions.

Dr. Henry Chan Lik Yuen
Dr. Chan has been serving as the Associate Dean (Global Engagement) at the Faculty of Medicine at CUHK since 2018, and served as the Assistant Dean (External Affairs) at the Faculty of Medicine at CUHK and the Head of Division of Gastroenterology and Hepatology, Department of Medicine and Therapeutics from 2013 to 2018.
Dr. Chan specializes in Gastroenterology and Hepatology. Key areas of his research interest include viral hepatitis, liver fibrosis, liver cancer, anti-viral therapy, and fatty liver disease. Currently, Dr. Chan is also the Director at the Institute of Digestive Disease, the Director at the Centre for Liver Health, and the Director at the Office of Global Engagement. His other honorary appointments include the Chairman for the Strategic and Technical Advisory Committee for Viral Hepatitis at the Western Pacific Regional Office of World Health Organization ("WHO").
Dr. Chan is a key investigator in over 30 Phase 1 to Phase 4 international trials on antiviral treatment of chronic hepatitis B and C, and is the global lead author in publications on peginterferon-alfa, peginterferon-lambda, telbivudine, tenofovir disoproxil fumarate, and tenofovir alafenamide for the treatment of viral hepatitis B. He has received numerous local, national, and international research awards including the Excellent Research Award by the Food and Health Bureau, Hong Kong in 2010 and 2014, and the National Award for Science and Technology Progress in 2012. He has published over 400 papers in peer-reviewed journals.

Dr. Chan graduated in medicine and completed his doctoral degree at CUHK in August 2001, where he was also appointed to a full professorship in the Department of Medicine and Therapeutics in August 2008. He is currently a Fellow of the Hong Kong College of Physicians, a Fellow of the Royal College of Physicians of Edinburgh and London, a fellow of the American Association for the Study of Liver Diseases, and an Honorary Consultant at the Prince of Wales Hospital. Prior to this, he joined the staff of the Prince of Wales Hospital in July 1993.

Dr. Philip Wy Chiu
Dr. Philip Chiu has been a Professor of Department of Surgery, Institute of Digestive Disease of CUHK since August 2010; the Director of CUHK Jockey Club Minimal Invasive Surgical Skills Center since November 2011; the Director of CUHK Chow Yuk Ho Technology Center for Innovative Medicine and the Assistant Dean (External Affairs), Faculty of Medicine, CUHK, since 2013.
Dr. Chiu graduated from the Faculty of Medicine, CUHK in 1994 with two scholarships. He became a fellow of the Royal College of Surgeons of Edinburgh, Hong Kong Academy of Medicine in 2001 and received his Doctor of Medicine at CUHK in 2009. Dr. Chiu was the first to perform endoscopic submucosal dissection ("ESD") for the treatment of early GI cancers in Hong Kong. In 2010, he performed the first Per-oral Endoscopic Myotomy ("P.O.E.M.") in Hong Kong. His research interests include upper gastrointestinal bleeding, esophageal cancer and minimally invasive and robotic esophagectomy, novel endoscopic technology for diagnosis of early GI cancers, ESD and novel endoscopic procedures as well as Natural Orifices Transluminal Endoscopic Surgery ("NOTES").
Currently Dr. Chiu is an honorary treasurer of the College of Surgeons of Hong Kong. He published over 100 peer-reviewed journals and 4 book chapters. He has received numerous prestigious awards including State Scientific Technology and Progress Award from the PRC in 2007 and 2nd class award in Technological Advancement, Ministry of Education of the PRC in 2011. Recently his research on P.O.E.M. was awarded the best of DDW 2011 and the first prize of ASGE world cup of endoscopy 2012. He is currently an associate editor of Digestive Endoscopy and co-editor of Endoscopy.

Dr. Vincent Mok Chung Tong
Dr. Vincent Mok has been serving as the Assistant Dean (Admissions) at the Faculty of Medicine, CUHK since January 2014, the Head of Division of Neurology of the Department of Medicine and Therapeutics, since December 2016 and has been appointed as the Mok Hing Yiu Professor of Medicine since November 2017. He has also been serving in Master Programme in Stroke and Clinical Neurosciences since July 2007.
Dr. Mok specializes in Neurology, Dementia, and Movement disorders. Key areas of research interest include Vascular Cognitive Impairment, Cerebral Small Vessel Disease, Neuroimaging in Cognitive Impairment, and Parkinson's Disease.
Dr. Mok has also been serving as a Convener of Lui Che Woo Institute of Innovative Medicine - Brain Theme since January 2017, the Director of Therese Pei Fong Chow Research Centre for Prevention of Dementia since May 2016, and Executive Committee Member of Chow Yuk Ho Technology Center for Innovative Medicine since January 2015.
Dr. Mok's qualifications include: Doctor of Medicine at CUHK (December 2005), Fellow of the Royal College of Physicians (Edinburgh) (July 2007), Fellow of the Hong Kong Academy of Medicine (December 2000), Fellow of the Hong Kong College of Physicians (July 2000), Member of the Royal College of Physicians (November 1996), and Bachelor of Medicine and Bachelor of Surgery (University of Sydney) (April 1993).

Dr. Kenny Kwan Yat Hong
Dr. Kenny Kwan serves as a Clinical Assistant Professor in the Department of Orthopaedics and Traumatology, Li Ka Shing Faculty of Medicine at HKU, and subspecializes in Spine Surgery. His key areas of research include basic and clinical research into adult and paediatric spine deformity, metastatic spinal cord compression and other spinal tumours, degenerative spinal disorders, and minimally invasive spine surgery.
Dr. Kwan earned his Fellowship of Royal College of Surgeons Edinburgh (Orthopedics) in 2011, and has been a Fellow of Hong Kong College of Orthopaedic Surgeons and a Fellow of Hong Kong Academy of Medicine since 2011. Additionally, Dr. Kwan has been a Member of the Royal College of Surgeons of England since 2006, and earned his Bachelor of Surgery and Bachelor of Medicine from the University of Oxford Medical School in 2002.

Scientific Advisors –

Dr. Keith Chan
Dr. Chan is currently a Senior Advisor of Cornerstone Intellectual Property Foundation in Taiwan. He is also serving as an adjunct professor at the Graduate Institute of Intellectual Property, College of Commerce, National Chengchi University and adjunct professor and advisor at the Research Center for Drug Discovery, National Yang Ming University in Taipei, Taiwan.
Dr. Chan co-founded GloboMax LLC, a drug development organization, in Hanover, Maryland, in July 1997, and served as a consultant for numerous multi-national pharmaceutical and biotech firms in the U.S, Europe and Asia. GloboMax LLC was acquired by ICON, plc. in August 2003, and Dr. Chan exited the operation. Prior to that, he joined the FDA in 1995 as a Director of Division of Bioequivalence, Office of Generic Drugs, responsible for managing and approval of generic drugs in the States. Dr. Chan had worked for Ciba-Geigy Corporation in Ardsley, New York, for 15 years, and held various senior and management positions. Dr. Chan also has extensive experience in new and generic drug development in

executing preclinical animal studies, bioassay development, Phases I to VI Pharmacokinetics, pharmacodynamics, bioavailability, bioequivalence studies, outside contract, regulatory submission, advanced drug delivery systems, and all phases of new drug development. In addition, he has served as Professor/adjunct Professor at the School of Pharmacy, University of Maryland at Baltimore during 1996 - 2009 and also as Adjunct Professor and National Board of Advisor, College of Pharmacy, University of Minnesota during 1984 - 2006. He has published more than 150 abstracts and research articles in peer-reviewed journals and delivered over 200 professional presentations. He was elected as Fellow of the American Association of Pharmaceutical Scientists ("AAPS") in 1995 for his scientific accomplishments on drug absorption in humans.
Although much of his career was based in the United States, Dr. Chan has been assisting Asian pharmaceutical and biotech companies for over 14 years. He has organized numerous workshops and conferences in the PRC, Taiwan, Hong Kong, Singapore and Korea. He lectures frequently in Asia and serves as a scientific advisor for many regulatory agencies in Asia. Over the last several years, he has successfully assisted many Asian companies in their technology transfers and licensing deals to and from the U.S., as well as with numerous regulatory submissions to the FDA.
Dr. Chan obtained his Ph.D. degree in Pharmaceutics from the University of Minnesota in January 1980.

Dr. William Wu Ka Kei
Dr. William Wu has been an Assistant Professor in the Department of Anaesthesia and Intensive Care at CUHK from December 2014 to August 2018, and he was promoted to Associate Professor in August 2018. Prior to this, Dr. Wu was appointed as a Research Assistant Professor in the Institute of Digestive Diseases at CUHK from December 2011 to November 2014. He is an expert in molecular pharmacology and toxicology. He has published extensively in cancer biomarkers and novel therapeutics, with over 220 peer-reviewed journals published on international journals, including Nature Communications, Molecular Biology and Evolution, Autophagy, Cell Research, and Cancer Research, and six book chapters with citations over 6,000 and an h-index of 40 (Scopus). His research has been recognized both nationally and internationally. He has earned his Fellowship of the Royal College of Pathologists (FRCPath) from his original works in toxicology, and has been conferred the Young Research Award by CUHK, the First-Class Higher Education Outstanding Scientific Research Output Award (Natural Science) by the Ministry of Education of the PRC, and the Second-Class State Natural Science Award.
Dr. Wu obtained his Ph.D. in Medical Sciences in December 2009 and received post-doctoral training from 2009 to 2011 in the Institute of Digestive Diseases both from CUHK.

Dr. Ka-Wai Kwok
Dr. Ka-Wai Kwok has been serving as Assistant Professor in Department of Mechanical Engineering, HKU since August 2014. He has also been serving as an Adjunct Assistant Professor in the School of Science and Engineering at The Chinese University of Hong Kong, Shenzhen ("CUHK SZ"), since October 2016.
His research interests focus on surgical robotics, intra-operative medical image processing, and their uses of high-performance computing techniques. To date, he has been involving in various designs of surgical robotic devices and interfaces for endoscopy, laparoscopy, stereotactic and intra-cardiac catheter interventions. His works have been highly recognized and winning several awards from IEEE international conferences in robotics and computing, including ICRA'18, RCAR'17, ICRA'17, ICRA'14, IROS'13 and FCCM'11, Hamlyn Symposium'12 and '08, and Surgical Robot Challenge'16. He also became the recipient of Early Career Awards 2015/16 offered by Research Grants Council of Hong Kong. He currently serves as associate editor for an academic journal, "Frontier in Robotics and AI".
He obtained his Ph.D. in The Hamlyn Centre for Robotic Surgery, Department of Computing, Imperial College London in March 2012, where he continued research on surgical robotics as a postdoctoral fellow between March 2012 and May 2013 and obtained the Croucher Foundation Fellowship between August 2013 and August 2014. This subsequently supported his research jointly hosted by The University of Georgia and Brigham and Women's Hospital - Harvard Medical School.

Dr. Jason Y.K. Chan
Dr. Jason Chan has been an Assistant Professor in the Department of Otorhinolaryngology, Head & Neck Surgery at CUHK since September 2014. Between June 2013 and September 2014, Dr. Jason Chan satisfied the Hong Kong Medical Council's requirements to practice medicine in Hong Kong and obtained his American Board certification while continuing his research interests. Dr. Chan graduated from Guy's, King's and St Thomas' School of Medicine in London in July 2005, followed by completion of specialist training in Otolaryngology, Head and Neck surgery at the Johns Hopkins School of Medicine with advanced training in head and neck surgery on microvascular reconstruction and robotics in June 2013.
His research interests include genomics, microbiome, diagnosis, treatment and surveillance of head and neck cancers and the development of novel robotic applications for head and neck surgery.
Dr. Chan's qualifications include: Licentiate of Medical Council of Hong Kong, Bachelor of Medicine and Bachelor of Surgery (London), Diplomate American Board of Otolaryngology, Head and Neck Surgery, Fellow of the Hong Kong College of Otorhinolaryngology, Fellow of the Hong Kong Academy of Medicine (Otorhinolaryngology), Fellow of the Royal College of Surgeons Edinburgh (Otolaryngology).

Dr. Owen Ko Ho

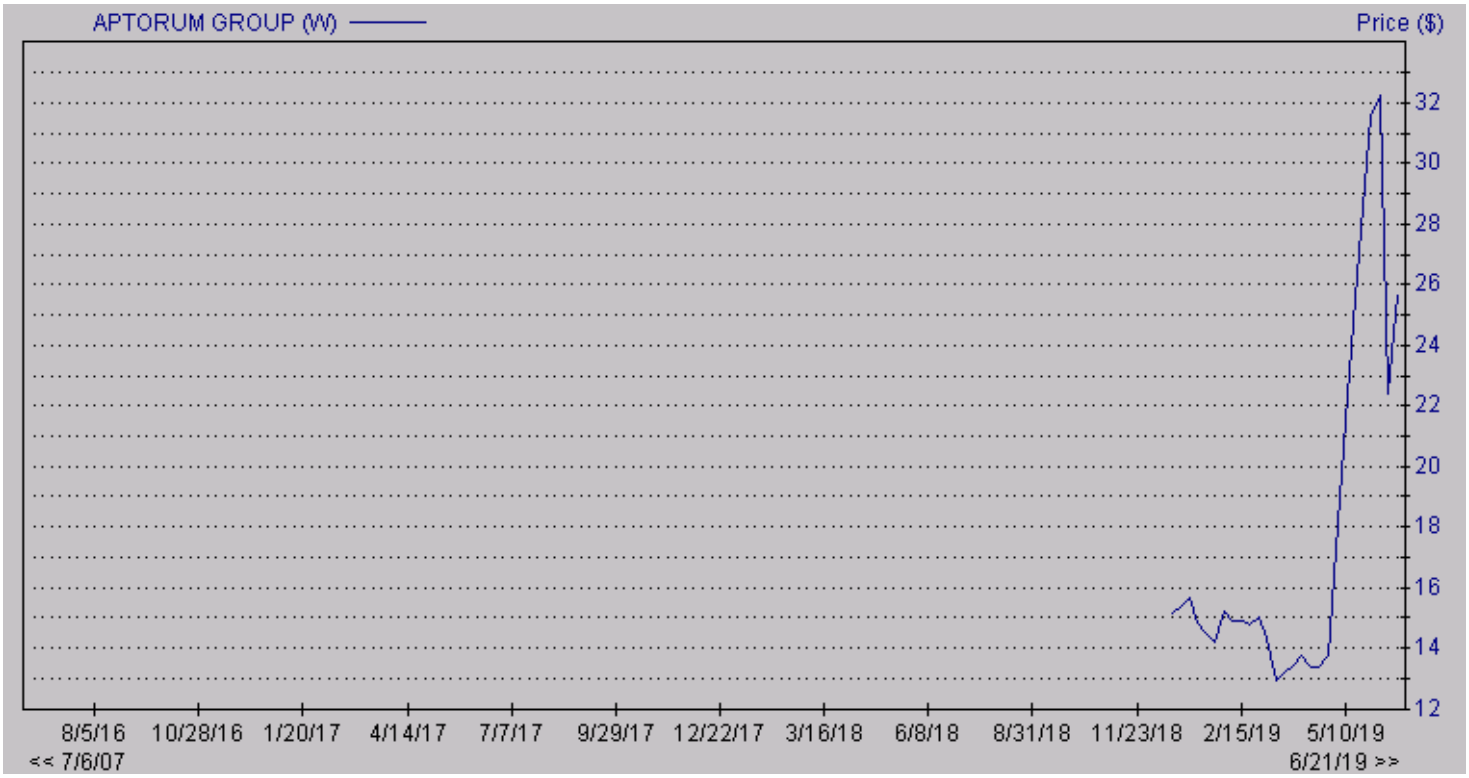
Dr. Ko has been serving as a principal investigator and executive committee member at the Gerald Choa Neuroscience Center since 2017, a principal investigator at the Li Ka Shing Institute of Health Sciences and a clinical lecturer (from 2016 to 2018) and Assistant Professor (since 2018) in the Department of Medicine and Therapeutics, with all appointments at CUHK. Leading a team with diverse expertise in biology, chemistry and engineering, his research work focuses on the principles by which neural circuits mediate sensory perception and learning, as well as development of novel neuroimaging techniques.
Dr. Ko was admitted to the Bachelor of Medicine and Bachelor of Surgery Programme (MBChB) at CUHK in 2005. After completing his second year of studies, he pursued a one-year Intercalated Bachelor of Medical Sciences (BMedSci), followed by a three-year Ph.D. program in neuroscience at University College London ("UCL") in the UK under the guidance of Professor Thomas Mrsic-Flogel. In 2012, Dr. Ko returned to Hong Kong and completed clinical training in 2015. He has published two first-authored Nature papers and one first-authored Nature Neuroscience paper from his Ph.D. studies. His breakthrough research has led to his runner-up award of the 2014 Eppendorf & Science Prize for Neurobiology, as the first awardee in Hong Kong.

Dr. Wai-Lung Ng
Dr. Wai-Lung Ng obtained his B.Sc. degree with a First-Class Honors in Chemistry from CUHK in 2010. With the support of the Hong Kong Ph.D. Fellowship and T.C. Cheng Postgraduate Scholarship, he completed his Ph.D. studies at CUHK in 2014. He was a Fulbright Scholar (2013-2014) at Massachusetts Institute of Technology ("MIT"), under the support from Lee Hysan Foundation and the Fulbright Program. He was then recruited to University of Oxford as a Croucher Foundation Postdoctoral Fellow from 2014-2016. He is currently a research fellow at Dana-Farber Cancer Institute/Harvard Medical School, researching in the field of chemical biology and cancer epigenetics.
Dr. Ng has strong interest in understanding diseases at the molecular level with a goal of developing tools to diagnose and treat them. His Ph.D. research focused on the synthesis of a new class of anti-diabetic agents, namely sodium-dependent glucose co-transporter 2 ("SGLT2") inhibitors. His research work has led to the identification of several stable, potent and selective SGLT2 inhibitors that potentially provide an alternative solution for treating diabetes. The central aim of his current research is to uncover the underlying mechanism of epigenetic regulations and to develop novel treatments for cancers and other human diseases.

Dr. Kenny Yu Kwok Hei
Dr. Kenny Yu was appointed as the NIHR Academic Clinical Lecturer at the University of Manchester in the United Kingdom in 2017.
Dr. Kenny Yu commenced specialist training in Neurosurgery at Salford Royal Hospital, United Kingdom in 2008 and attained his FRCS (Surgical Neurology) specialist qualification in 2018. His research interests are in myeloid cell infiltration in malignant gliomas, intra-tumoral delivery of therapeutics and in the application of advanced data analytical technology for biological and clinical datasets. He completed his Ph.D. in 2016 at the Stem Cell and Neurotherapies Laboratory at the University of Manchester under Prof Brian Bigger and subsequently completed a post-doctoral research fellowship at Dr. Peter Dirks laboratory in Toronto, Canada.
Dr. Yu's key areas of research interests include Neurosurgery, Neuro-oncology, Cancer Inflammation and Cancer Immunology.

Dr. Sunny Wong Hei
Dr. Sunny Wong has been an Assistant Professor in the Department of Medicine and Therapeutics, and an investigator at the laboratory of the Li Ka Shing Institute of Health Science at CUHK since December 2013. He is also the leader of the Clinical Metagenomics Research Group, with a focus to study the mechanistic role and translational potential of host-microbial interactions in diseases.
Dr. Wong has been a specialist in Gastroenterology and Hepatology since September 2016, and is a Physician-Scientist with expertise in genomics and molecular microbiology. He has published over 60 peer-reviewed journals in international journals, including the New England Journal of Medicine, Nature Genetics, Nature Communications, Gastroenterology and Gut as of December 2017. He has been an investigator in epidemiological studies and clinical trials, and a member of the local clinical research ethics committee since 2016.
Dr. Wong's qualifications include: MBChB(Hons)(CUHK) (June 2006); DPhil (Oxon) (June 2010); MRCP (UK) (February 2012); FHKCP (September 2016); FHKAM (Medicine) (December 2016); FRCP (Edin) (September 2017); FRCPath (February 2018).

HISTORICAL STOCK PRICE



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