

Technology/ Title	An Anti-Obesity Nanotechnology to Modulate Oil Absorption	
Technology Type	<input checked="" type="checkbox"/> Biotechnology	<input type="checkbox"/> Device/Diagnostics
	<input checked="" type="checkbox"/> Pharmaceutical	<input type="checkbox"/> Others:_____ -
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Technology Description	<p>Obesity is a disease of modern civilization. The World Health Organization (WHO) issued a statement asserted that, from 1980 to today, the number of obese people in the world had more than doubled, and comprised 40% of the global population. Obesity can cause many chronic diseases, such as cardiovascular disease, diabetes, and other life-threatening ailments. Therefore, weight control has become one of the world's most urgent health issues.</p> <p>However, in the anti-obesity market, the use of weight-controlling drugs that reduce fat absorption, such as Xenical, produce some unpleasant side effects, such as steatorrhea. In an effort to minimize or eliminate these unpleasant side effects, drug dosages have been reduced. However, this has led to much lower effectiveness of the drugs. Orlistat is the main active ingredient of many existing weight-controlling drugs. It acts as a lipase inhibitor to reduce the degradation and <i>in vivo</i> absorption of gastrointestinal fats resulting in excess fat being excreted from the large intestine.</p> <p>In our study, using a nanomaterial that can adsorb oil and creative gelatinization/solidification reduced side effects of these drugs. The high surface area (800-1000 m²/g) of mesoporous silica nanoparticle (MSN) makes it suitable as an option for such materials. Silicon dioxide is also biocompatible, and has been widely utilized in food additives and as an anti-acid agent in gastrointestinal medications. Based on the above characteristics, MSN is attractive as a material for combination therapy with Orlistat. Here, we have developed and used MSN to reduce the side effects of lipase inhibitor-based anti-obesity drugs, thereby enhancing the utility and market development of these drugs.</p>	

Intellectual Property	<p>Our current proprietary technology using MSN to reduce the steatorrhea associated with Orlistat has acquired certain important international patent protection laws and regulations currently in force protect our key concepts and technologies, including:</p> <ol style="list-style-type: none"> 1. US patent (US9185928, 2015/11/17) 2. China patent (CN104955446, 2017/08/22) 3. Europe patent (EP2934495, 2017/07/19 – Nations registered: UK, Germany, France, Italy, and Spain). 4. Taiwan patent (TWI614017, 2018/02/11) 5. Australia patent (AU2013361217, 2018/09/20)
Key Publications	<ol style="list-style-type: none"> 1. Chen, N.T., Souris, J.S., Cheng, S.H., Chu, C.H., Wang, Y.C., Konda, V., Dougher, U., Bissonnette, M.B., Mou, C.Y., Chen, C.T., and <u>Lo, L.W.*</u> (August, 2017) Lectin-functionalized mesoporous silica nanoparticles for endoscopic detection of premalignant colonic lesions. <i>Nanomedicine-Nanotechnol. Biol. Med.</i> 13(6): 1941-1952. 2. Chen, N.T., Tang, K.C., Chung, M.F., Cheng, S.H., Huang, C.M., Chu, C.H., Chou, P.T., Souris, J.S., Chen, C.T., Mou, C.Y., and <u>Lo, L.W.*</u> (2014) Enhanced plasmonic resonance energy transfer in mesoporous silica-encased gold nanorod for two-photon-activated photodynamic therapy. <i>Theranostics</i> 4(8): 798-807. 3. Cheng, S.H., Li, F.C., Souris, J.S., Yang, C.S., Tseng, F.G., Lee, H.S., Dong, C.Y., and <u>Lo, L.W.*</u> (2012) Visualizing dynamics of sub-hepatic distribution of nanoparticles using intravital multiphoton fluorescence microscopy. <i>ACS Nano</i> 6 (5): 4122–4131. 4. Cheng, S.H., Hsieh, C.C., Chen, N.T., Chu, C.H., Huang, C.M., Chou, P.T., Tseng, F.G., Yang, C.S., Mou, C.Y., and <u>Lo, L.W.*</u> (December, 2011) Well-defined mesoporous nanostructure modulates three-dimensional interface energy transfer for two-photon activated photodynamic therapy. <i>Nano Today</i> 6(6): 552-563.
Business Opportunity	<p>The type of lipase inhibitor drug for weight control with Orlistat as the main component is relatively safe, convenient, and is administered only orally. According to a GBI Research 2017 study, the market for diet pills that contain Orlistat has an overall market share of over 75%, and is expected to increase from USD \$ 750 million in 2012 to USD \$ 2.6 billion in 2019 (CAGR approximately 20.7%; average gross margin of approximately 47%). In addition, Alli, produced by the Dutch manufacturer GSK, has been able to reduce its dosage by half.</p>

	<p>Consequently, Alli has become an over-the-counter drug, which has made it convenient and more appealing to most people. However, the side effects of Orlistat, such as diarrhea and other gastrointestinal symptoms, still affect its use. In fact, approximately 79% of patients taking Orlistat complain about the occurrence of gastrointestinal problems. Orlistat, as the main component of lipase inhibitor types of drugs, certainly possesses many relative market advantages. To further strengthen the market for this drug, our proprietary biocompatible MSN provides a high surface area to adsorb and solidify excess gastrointestinal non-degraded oil, minimizing or eliminating undesirable side effects. It constitutes the key to greatly improving Orlistat-type drug market dominance and accompanying customer satisfaction.</p>
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