

國立台北科技大學高值生醫材料研究與商品化中心專題演講 (一)

題目：Novel Drug Delivery System Using Nano-Prodrugs

講者：笠井均(Hitoshi KASAI) / 東北大学多元物質科学研究所

時間：2023 年 08 月 30 日(星期三) PM 15:20~17:00

地點：化工館 101 電化教室

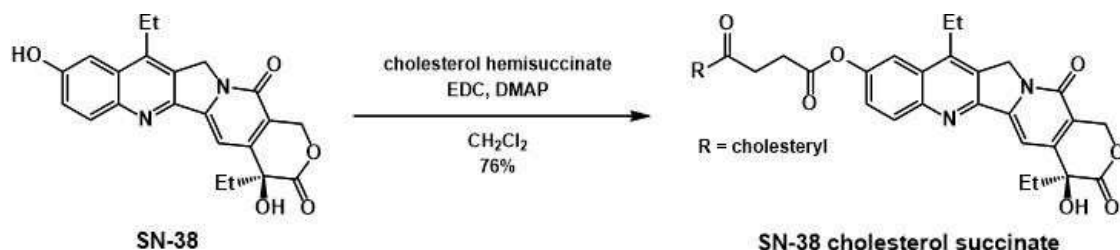
## Novel Drug Delivery System Using Nano-Prodrugs

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In this presentation, we propose a new concept, termed "pure nano-drugs" (PNDs), which are comprised of drug ingredient and are delivered into cells in a carrier-free state without using polymer. As the model of PNDs, the nanoparticles of SN-38 cholesterol succinate which is the derivatives of SN-38 having the high anticancer activity were fabricated with less than 100 nm in size (Fig.2) by the reprecipitation method<sup>[1]</sup> developed at our laboratory<sup>[2]</sup>. Aqueous dispersion of the nanoparticles has been shown to exhibit an extremely effective anti-cancer activity not only *in vitro* experiment but also *in vivo* experiment, when compared to irinotecan, a prodrug of SN-38 and a widely used water-soluble anticancer monomer<sup>[3]</sup>. In addition, interestingly, unlike conventional polymer micelle nanodrugs, our nanodrug has a hydrophobic surface, so it was found that the nanodrug penetrated into cancer cells and exerted its pharmacological effect<sup>[4]</sup>.



**Figure 1** Synthesis of SN-38 cholesterol succinate

➤ **Speaker Name**

Hitoshi KASAI

➤ **Current Position**

Institute of Multidisciplinary Research for Advanced Materials (IMRAM),  
Tohoku University, Sendai 980-8577, Japan

➤ **Education & training**

- Ph. D. in Department of Chemistry, Faculty of Science, Tohoku University, 1996(March)
- M.S. in Department of Chemistry, Faculty of Science, Tohoku University, 1993(March)
- B.S. in Department of Chemistry, Graduate School of Science, Tohoku University, 1991(March)



➤ **Professional experience**

- Professor/ Associate Professor/ Assistant Professor
  - 1999(April)-2001(March) Assistant (to Prof. H. Nakanishi) in Institute for Chemical Reaction Science, Tohoku University
  - 2001(April)-2004(March) Assistant (to Prof. H. Nakanishi) in Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Sendai, JAPAN
  - 2004(April)-2016(March) Associate Professor (to Prof. H. Nakanishi) in Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Sendai, JAPAN
  - 2016(April)-Present Professor in Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Sendai, JAPAN
- Postdoctoral Research Fellow
  - 1996(April)-1999(March) Post Doctoral Fellow, in New Energy and Industrial Technology Development Organization (NEDO)

➤ **Honor/Awards**

- 1999 Award for Encouragement of Research in Polymer Science, The Society of Polymer Science, of Japan
- 2001 Young Scientists Award, The Chemical Society of Japan

➤ **Biography Brief**

Dr. Hitoshi Kasai has been a professor of Tohoku University, Sendai since 2016. After receiving a Ph.D. degree from Tohoku University in 1996, he worked at New Energy and Industrial Technology Development Organization (NEDO) until 1999, then became an Assistant Professor at Tohoku University. In 2004, he was promoted to be an Associate Professor at Institute of Multidisciplinary Research for Advanced Materials (IMRAM), Tohoku University, concurrently worked as a PRESTO researcher from 2007 to 2011, followed by a full Professor position at IMRAM from 2016. During his Ph.D., he was majored in the creation of organic crystals with the main focus was on their electronics and photonics applications. Not long after, he realized the extreme potential of the technique in the creation of nanocrystals composed of pure anticancer drug molecules. The obtained nano-prodrugs showed greatly enhanced delivery efficacy while reducing the side effects which were usually caused by drug carrier materials in the conventional methods. With the great dedication for the last decade, his laboratory has been one of the first initiation in the field and gradually strengthen the possibility of the carrier-free DDS. Until date, he has co-authored more than 300 publications including original papers, reviewing articles, book chapters and patents.