• 計畫中文名稱	建立下泌尿道功能監控之實驗動物研究		
• 計畫英文名稱	Animal Studies for Monitoring and Control of Lower Urinary Tract Activity		
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• 研究領域	醫學工程		
• 研究人員	程千里,陳家進,陳天送		
• 中文關鍵字	應力性尿失禁；會陰神經損傷；電刺激；膀胱壓力；		
• 英文關鍵字	stress urinary incontinence；pudendal nerve injury；electrical stimulation ；intravesical pressure；		
• 中文摘要	下泌尿道的主要功能為儲存以及排放尿液，這些功能需要膀胱與周圍的膀胱出口、尿道以及外尿道括約肌有著良好的互相協調收縮才能達成。應力性尿失禁是最常發現於中年婦女的尿失禁類型。傳統治療應力性尿失禁為協助病人來減低漏尿，包括使用藥物治療以及進行手術。但這些方式往往有副作用，有可能造成尿液的囤積或者尿路感染。最近臨床醫師藉由刺激神經，來調控下泌尿道排尿與儲尿的功能。然而這些刺激方式缺乏即時膀胱狀態的回饋，以及一個可信的監測系統來驗證治療的效果。本計畫的目標為發展一套可以偵測膀胱活動與改善下泌尿道功能的整合系統。首先在迷你猪隻建立一單側會陰損傷模式，這模式會造成下泌尿道結構與功能的改變。會陰神經損傷的猪隻會出現較低的排尿壓力以及餘尿量的增加，這和應力性尿失禁病人臨床特徵相似，故適合拿來作為驗證子計畫一生物微系統以及子計畫二使用超音波計算及預測膀胱容量與壓力之實驗動物模式。初期整合的無線傳輸模組以及超音波系統將以急性、麻醉的單側會陰神經損傷猪隻作為研究。第二年則將在清醒的會陰神經損傷猪隻置入密封之膀胱感測器進行膀胱活動觀測。第三年計畫重點放在發展可以長期置入整合完成的感測平台於清醒，可自由活動的實驗猪隻體內，並搭配超音波系統進行完整的尿失禁模式試驗。對於植入物的組織反應將透過組織學上的觀察來看組織增厚的情形，以及在植入物周圍產生纖維囊腫之變化情況。這次計畫之行動式尿動力學監測平台將透過一植入式微刺激器，對於清醒但下泌尿道生理不正常的動物進行神經調控，作為一具有回饋之膀胱控制系統。		
• 英文摘要	The primary functions of the lower urinary tract (LUT) are storage and periodic elimination of urine. These functions require reciprocal coordination of the urinary bladder and the outlet including bladder neck, urethra, and external urethral sphincter (EUS). Stress urinary incontinence (SUI) is one of the most common forms of incontinence among middle aged women. Several traditional methods have been used to help patient to prevent leakage, including drug treatment and surgery, but these approaches always cause some side effects, urine retention or infection. Recent clinician has utilized the neural modulation via a neural interface to control of the storage and voiding functions. However, this approach is lack of a suitable feedback signal reflecting the bladder condition and a reliable monitoring in efficiency of treatment. The ultimate goal of this study is to develop an integrated platform included detecting bladder activity and improvement of lower urinary activity function. The overall objectives of this three-year research are first to establish acute animal model, mini-pig, of unilateral pudendal nerve injury (UPNI) which results in changes in lower urinary tract structure and function. Decrease UPNI pig presents low voiding pressure and increase of residual urine, that also manifested by SUI patient served as a verification model for validating the biomicrosystem of subproject and ultrasound technique of subproject for measuring the bladder volume and estimate the intravesicle pressure. The pilot integration of the wireless sensing module and ultrasound technique can be put into trial in the acute anesthetized UPNI pig model simultaneously. With the mature of acute UPNI pig model, the second year animal experiment to be conducted for monitoring of bladder activity in conscious UPNI pigs by hermetic package of wireless sensing module. The third year will focus on developing an integrated platform for awake, free-moving UPNI minipig model from which chronic implantation of wireless sensing model as well as ultrasound can be fully test under SUI model. The tissue reaction to the implants was evaluated histologically by examining the thickness and quality of the fibrous capsule surrounding the implants, and the quality of the interface. This ambulatory urodynamic monitoring module allows us to perform varied neuromodulation scheme via an implantable microstimulator while the animal is awake and under physiologically normal condition.		