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| **Prevention and Control Of Major Chronic Non-Infectious Diseases** |
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| **Research background:**Chronic non-infectious diseases are among the most concerned diseases that threaten the health of Chinese people. According to the report on nutrition and chronic diseases of Chinese residents (2015) issued by the State Council, the mortality of chronic diseases in China was 533/10 million, and chronic non-infectious diseases accounted for 86.6% of the total deaths in 2012. Among them, cardiovascular diseases, malignant tumors, chronic obstructive pulmonary disease (COPD), diabetes and neuropsychiatric diseases are the main causes of death, and the incidences are increasing rapidly. The proportion of these major diseases increased from 65.5% in 1990 to 79.4% in 2010. More seriously, due to the change of life style and theaging of the population, it is expected that the morbidity in China will continue to growin the next 10-15 years. The overall goal of this project is to solve the key problems in treating cardiovascular diseases, malignant tumors, COPD, diabetes and neuropsychiatric disorders and other serious major chronic disease that threatenpeople's healththrough large sample, population-based multicenter clinical trials. We will set up public platform, establish and perfect the research system and innovation network to make significant breakthroughs in the prevention and control of major chronic diseases. New technologies, molecular markers and prevention guidelines would be identified and developed. Four programs are included in this project: "Development of new technology and scheme on cervical cancer screening and intervention ", "Study on correlations with nutrition and influence factors in children and adolescents with diabetes ", "Identification of early diagnosis biomarkers and comprehensive diagnosis index system in Parkinson's disease” and “Tumor therapy by targeting tumor lactate anions and hydrogen ions”.  |
| **Main research topics and progress:**1. **Development of new technology and scheme on cervical cancer screening and intervention**:(1) Wehave been carryingout clinical trials of screening programs by established technologies andselect appropriate solutions in large population (50 000). (2) Amulticenter clinical trial of the new generation of hybrid capture technology approved by China FDA (De Tong company, Hangzhou)has been conductedin a large population (12 000). (3) A new technique for detection of microRNA as a molecular marker in cervical exfoliated cellshas been developed.
2. **Study on correlations with nutrition and influence factors in children and adolescents with diabetes**:At present, the urine screening in more than 9 000 school children of 5-18 year old in Hangzhou, Lishui, Jinhua, Tianjin, Shanghai and Wuhan has been completed. In addition, retrospective analysis of high risk factors in more than two hundred cases of hospitalized children with new onset diabetes has been finished. Relationships between nutritional status and morbidity in children and adolescents were analyzed.
3. **Identification of early diagnosis biomarkers and comprehensive diagnosis index system in Parkinson's disease**:(1) By using magnetic resonance susceptibility imaging (brain iron research), we found that regional iron deposition is a potential biomarker for Parkinson's disease. It helps early recognition of Parkinson's disease and provides new ideas for explaining the mechanism of different sports injuries.(2)By using magnetic resonance functional imaging, we found that different manifestations of basal ganglia network in Parkinson's disease (e.g. occipital lobe function) can be used to explain different types of sports injuries (tremor / motor delay). Functional magnetic resonance imaging (fMRI) and biochemical protein index in cerebrospinal fluid (CSF) were studied. It was found that the change of brain function in cingulate gyrus of Parkinson's disease is significantly related to the content of tau protein in CSF, and is related to cognitive impairment in patients with Parkinson's disease. (3) By magnetic resonance structure imaging, it was found that atrophy exists in both sides of the brain area in unilateral Parkinson's patients (e.g. temporal lobe) and bilateral changes in the brain structure properties, especially in the affected limb contralateral temporal lobe.
4. **Tumor therapy by targeting tumor lactate anions and hydrogen ions**:(1) We trained doctors for radiation intervention in many hospitals, to promote the application of TILA-TACE. (2) A clinical study that is expected to include 2000 patients with advanced hepatocellular carcinoma has been designed. At present, it is in the process of clinical ethics examination and approval in the hospital.(3) We received the invitation from the chief editor and wrote an article for the journal of Signal Transduction and Targeted Therapy, in which we systematically put forward the theoretical basis and clinical practice of targeting tumor lactic acid anion and hydrogen ion in tumor therapy.
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| **Representative achievements:****Publications:**1. Hu X, Chao M, Wu H. Central role of lactate and proton in cancer cell resistance to glucose deprivation and its clinical translation. Signal Transduction and Targeted Therapy, 2017, 2, e16047; doi:10.1038/sigtrans.2016.47
2. Zhang W, Guo C, Jiang K, Ying M, Hu X. Quantification of lactate from various metabolic pathways and quantification issues of lactate isotopologues and isotopmers. Scientific Reports, 2017, 7: 8489, DOI:10.1038/s41598-017-08277-3
3. Wang R, Jin C, Hu X. Evidence of drug-response heterogeneity rapidly generated from a single cancer cell.Oncotarget. 2017, 8:41113-41124. doi.org/10.18632/oncotarget.17064
4. Guan X, Xu Xand Zhang M. Region-Specific Iron Measured by MRI as a Biomarker for Parkinson's Disease.Neurosci Bull. 2017 Oct;33(5):561-567. doi: 10.1007/s12264-017-0138-x.
5. Rahim Ullah, Yan Su, Yi Shen. et al. Postnatal feeding with high-fat diet induce obesity and precocious puberty in C57BL/6J mouse pups: a novel model of obesity and puberty. Front. Med.2017.2:266-277

**Follow-up funding:**With the support of this project, we received other seven follow-up funds, a total of 4.62 million RMB, including five projects of National Natural Science foundations and one National Development Plan of digital medical equipment R & Din “13th Five-Year” by the Ministry of Science andTechnology. Application for the establishment of the center for diagnosis and treatment of major diseases in Zhejiang province got approved witha 5 million RMB research fund. |