

Attachment 1:

Funding Scheme for Scientific Research and Innovation
Application Guidelines for Projects Type C
“Technical Requirements Category”
(2023)

I. Background

To further match scientific research in universities with enterprise requirements, facilitate enterprises' innovative R&D and transformation of scientific research achievements, expand overall investment in Macao's scientific research, and accelerate the cultivation of emerging industries, the Science and Technology Development Fund (FDCT) has collected technical requirements from Macao's enterprises (or other application institutions) that restrict their development, with the support from the mainland experts, to select a number of projects that can solve the requirements in the near future and significantly improve the core competitiveness of enterprises, for application by the scientific research teams of Macao's universities. It is expected that the problems in enterprise development will be solved with the scientific and technological strength of Macao's universities (or in collaboration with universities, research institutions and enterprises in the mainland and Macao).

II. Overall Objective

To encourage scientific research teams of universities in Macao to conduct R&D catering to the technical requirements of enterprises (or other application institutions), facilitate closer industry-university-research partnership, accelerate the transformation of scientific research achievements, and cultivate emerging industries, so as to promote the moderate and diversified development of Macao's industries.

III. Areas of Technical Requirements

(I) Traditional Chinese Medicine and Biomedicine

Direction 1: R&D of TCM Drugs Based on Macao Registration

1. Requirement Proposing Unit: Guangzhou Pharmaceutical Group (Macao) International Development Co., Ltd.

2. Contact: Chan Si Un (68589677)

3. Details of Technical Requirement: Seek cooperation with universities and scientific research institutions to complete the R&D of 1 TCM compound preparation of classical prescriptions and 3 modified new drugs based on the relevant requirements of Macao's regulations on registration of Chinese patent medicines.

4. Key Technical Indicators:

(1) 1 TCM compound preparation of classical prescriptions: Establish a complete set of technical data for registration application of medicinal materials, decoction pieces, reference samples and preparations with reference to/in accordance with the *Technical Requirements for Registration Files of TCM Compound Preparations of Classical Prescriptions, Technical Guidelines for Pharmaceutical Research on TCM Compound Preparations Managed As Per Catalogue of Ancient Classical Prescriptions (Trial)*, etc.

(2) 3 modified new drugs: Take high-quality Chinese patent medicines in the mainland as the research object and establish a complete set of technical data for registration application (including improving quality standards and changing dosage forms) with reference to/in accordance with the *Technical Requirements for Registration Files of Chinese Patent Medicines, Technical Guidelines for Research on Modified New TCM Drugs*, etc.

(3) Obtain at least 2 registration approvals.

5. Eligibility: Macao universities with R&D strength and with the capabilities to solve practical problems of product declaration, and can work in collaboration with universities, research institutions and enterprises in the mainland and Macao.

6. Research Funding: Application for funding of MOP 5 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests: Assigned to the enterprise.

8. R&D Cycle: 36 months

Direction 2: R&D of Innovative TCM Drugs

1. Requirement Proposing Unit: Nam Yue Natural Medicine Co., Limited

2. Contact: Wong Un Kam (68867743 / 18583268487)

Hao Ioi (68275718 / 18898533001)

3. Details of Technical Requirement: Based on the registration requirements of “innovative drugs” in the Macao Registration Act of Chinese Patent Medicines, 2 of the following 4 types of innovative TCM drugs are selected for R&D:

(1) Innovative nosocomial preparation for pulmonary infection;

(2) Innovative drug for cough treatment with Citri Grandis Exocarpium as the main ingredient;

(3) Innovative topical Chinese patent medicine in the form of oil (ointment) for treating skin inflammation/ pain and other discomforts;

(4) Innovative drug derived from traditional Chinese medicine or natural medicine for pain relief.

4. Key Technical Indicators:

Complete the preclinical studies of 2 types of Chinese patent medicines, including pharmaceutical study, toxicological study and pharmacological study, and obtain the clinical approval documents from the Macao Medical Products Administration.

5. Eligibility: Macao universities with R&D strength of new TCMs and with the capabilities to solve practical problems of product declaration, and can work in collaboration with universities, research institutions and enterprises in the mainland and Macao.

6. Research Funding: Application for funding of MOP 5 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests: Assigned to the enterprise or determined according to the cooperative development agreement.

8. R&D cycle: 36 months

Direction 3: Validation of Key Biomarkers for CKD and Development of POCT and Clinical Products

1. Requirement Proposing Unit: Kiang Wu Hospital

2. Contact: Peng Hong Quan (hpeng93170@gmail.com)

3. Details of Technical Requirement: In this project, it is proposed to build a rapid and sensitive detection and product development platform for the early screening of new metabolomic markers of identified chronic kidney disease (CKD), clinically effective evaluation and development of new technologies and products for rapid and sensitive detection, so as to realize rapid and sensitive detection and screening of patients with CKD. In the project, 3-4 key small molecule metabolites will be selected to carry out clinical validation in healthy populations and patients with different CKD stages respectively to determine the reference range of 2-3 new markers. An R&D system based on clinically effective evaluation, POCT and clinical products is constructed for the screened new metabolomic markers to provide effective help for renal function monitoring and early screening of CKD patients.

4. Key Technical Indicators:

(1) Conduct a large-sample multicenter clinical study for identified new metabolomic markers of CKD to establish a reference range for 2-3 new markers.

(2) Develop and validate the POCT process for new metabolomic markers with high sensitivity, selectivity, etc.

(3) Developed a set of POCT products for CKD, including reagents and portable detectors for new metabolomic markers to realize rapid detection; the detection sensitivity should be $\leq 2\text{mg/L}$ and the linear range should be $5\text{mg/L}-300\text{mg/L}$; detection sensitivity of the instrument should reach pg/mL .

(4) Apply for 2 patents and obtain 1 state medical device registration certificate; and 2 third-party test reports for registration.

5. Eligibility: Universities with R&D strength of high-level POCT technology, with collaborative units including universities, research institutions and enterprises in the mainland and Macao, such as enterprises with mature POCT industrial production lines and product development foundations and medical institutions with clinical research foundations for CKD and a large number of clinical samples.

6. Research Funding: Application for funding of MOP 5 million from FDCT.

7. Ownership of Intellectual Property Rights and Interests: Jointly owned according to the cooperation agreement.

8. R&D cycle: 36 months

(II) Big Data and Artificial Intelligence

Direction 1: Early Warning System for Network Faults

1. Requirement Proposing Unit: Fnetlink Technology Company Limited

2. Contact: Lei Chi Jeong (66613123/leichiieong@fnetlink.com)

3. Details of Technical Requirement:

(1) Study the contents and methods of network monitoring for early warning of network faults, use artificial intelligence-related technologies to complete corresponding model training, establish a big data model for monitoring, and realize prediction and identification of network faults.

(2) Study the methods of network fault locating, identification and handling, and build an operation and maintenance scheme for heuristic fault handling.

(3) Develop an early warning system for network operation and maintenance based on the big data model for monitoring and heuristic fault handling scheme, and conduct demonstration application for functions such as network monitoring, fault locating, identification, and early warning.

4. Key Technical Indicators:

(1) Fault detection rate $\geq 80\%$;

(2) Fault false alarm rate $\leq 3\%$;

(3) Fault locating precision $\geq 90\%$;

(4) Accuracy of fault type identification $\geq 95\%$;

(5) Lead time of fault prediction ≥ 1 day;

(6) Scale of demonstration application system network ≥ 2000 nodes.

5. Eligibility: Make up for the shortcomings of the enterprise, conduct joint R&D, keep strong confidentiality, and can work in collaboration with universities, research institutions and enterprises in the mainland and Macao.

6. Research Funding: Application for funding of MOP 4.5 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests: Assigned to the enterprise.

8. R&D Cycle: 36 months

Direction 2: Fatigue and Emotion Evaluation Based on Multimodal Information Such as EEG and Its Application

1. Requirement Proposing Unit: Boardware Information System Limited

2. Contact: Ou Binkai (62049988)

3. Details of Technical Requirement: In view of the requirements for high-accuracy recognition of fatigue and emotion, combined with the existing Barco brain computer acquisition equipment of Boardware Information System Limited, further develop a non-invasive acquisition system with flexible sensing and high precision based on human physiological signals such as EEG, EOG, and facial expression; develop an accurate evaluation algorithm for fatigue state and emotion based on multimodal information such as EEG; construct criteria for consumer-grade brain-computer interactions based on pan-human-computer interaction scenarios; build a corresponding creative interactive application development framework and realize the application verification of more than 2 scenarios such as human-computer interaction on this basis.

4. Key Technical Indicators:

The expected results and technical indicators are as follows:

- (1) Develop a set of hardware systems for signal acquisition, amplification and transmission to provide 24-bit ADC (number of channels ≤ 16) for various human physiological signals such as EEG, EOG, and facial expression.
- (2) Adopt wearable and flexible electrode technology and user-friendly design to achieve the goals of comfortable wearing and long battery life.
- (3) Be able to identify major emotional states such as joy, anger, sorrow and pleasure, with cross-user algorithm precision of more than 80%.
- (4) Be able to identify at least 4 levels of fatigue, with cross-user algorithm precision of more than 80%.
- (5) Realize the embedded application of emotion recognition algorithm in the wearable system, and has the ability to recognize data of non-training set.

5. Eligibility: Have leading scientific research level and ability both domestically and internationally, rich practical experience, experimental equipment and conditions in related fields, and can work in collaboration with universities, research institutions and enterprises in

the mainland and Macao.

6. Research Funding: Application for funding of MOP 4 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests: Assigned to the enterprise or determined according to the cooperative development agreement.

8. R&D Cycle: 36 months

IV. Experts Participating in the Preparation

1. Traditional Chinese Medicine and Biomedicine

Liu Zhongqiu	Professor of Guangzhou University of Chinese Medicine
Cao Hui	Professor of Jinan University
Chen Qiaolin	Researcher of Zhongke Cell Technology (Guangzhou) Co., Ltd.
Hu Wenhao	Professor of Sun Yat-Sen University
Wei Mei	Chief Pharmacist of China Traditional Chinese Medicine Holdings Co., Ltd.

2. Big Data and Artificial Intelligence

Li Guanglin	Researcher of Shenzhen Institute of Advanced Technology of the Chinese Academy of Science
Cai Yanguang	Professor of Guangdong University of Technology
Yin Jian	Professor of Sun Yat-sen University
Deng Lianbing	Researcher of Zhuhai Dahengqin Technology Development Co., Ltd.
Yang Haibin	Senior Engineer of Foshan Huashu Robot Co., Ltd.