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Rethink of Diabetes Treatment and Drug Development

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Abstract

Diabetes Mellitus is a modern epidemics and refractory disease caused by overeating or insulin-related pathogenesis. However, treatment for *diabetes mellitus* is no easy task. There are many problems facing *diabetes mellitus* therapy; Insulin or its peptide derivatives need needle injection every day, which lead to treatment inconvenience and burdens for patients; Disease complications, such as cardiovascular symptoms, eye impairment or kidney failure are even fatal for some of patients; Drug toxicities owing to long-term utilization of chemical drugs are equally harmful for patients. In this editorial, we will offer some new ideas for building *diabetes mellitus* treatment systems, drug design and development pipelines and possible future directions are given and highlighted.

Keywords: *Diabetes mellitus*; insulin; insulin-derivatives; small molecular chemical; bee extract; *Qi-Gong*, cardiovascular complication; hyperglycemia; drug toxicity; Propolis; genetics; genomics; pharmacogenomis

Background

Diabetes Mellitus is an old disease but modern epidemic and also refractory disease caused by overeating or insulin-related pathogenesis. However, treatment for *diabetes mellitus* is no easy task. There are three major problems facing *diabetes mellitus* therapy; 1. Insulin or its peptide derivatives need needle injection every day, which lead to treatment burden for patients [1]; 2. Disease complications, such as cardiovascular symptom, eye impairment or kidney failure are even fatal for some of *diabetes mellitus* patients; 3. Drug toxicities owing to long-term utilization of chemical drugs are equally harmful impacts for many *diabetes mellitus* patients [2-4]. In this editorial, we will offer some new ideas for *diabetes mellitus* treatment and drug design and development pipelines and clinical trials in following topics.

Reducing toxicities or side-effects of diabetes mellitus treatment drugs apart from insulin or insulin-derivatives

Many chemical synthetic *diabetes mellitus* treatment drugs are toxic to patients when they are long-term applications in clinics [2-4]. Now, some developing countries license and sell anti-hyperglycemia chemicals based on only one or two proposed enzymes or "mechanisms" relating to *diabetes mellitus*. The quality of toxicity study of these "drugs" is very limiting, and even toxicity study for animals is also dramatically lacking. These licensed drugs are very harmful for *diabetes mellitus* patients and confusing and misleading audience and government. Thus drug administration agency should control the quality and number of anti-hyperglycemia chemicals. Over licensing anti-hyperglycemia chemicals will surely offset the treatment outcomes for patients with *diabetes mellitus*. We think that a lot of reported drug-active enzymes are not relevant to disease progression and as proper treatment targets. Herein, we argue that government funding body ought to monitor the technical and long-term outcome of its funding and not financially help and support such *diabetes mellitus* treatment study without any proper toxicity investigations and sounding pharmacological or translating work, let alone licensing these "drugs". To set more rigorous toxicity baseline for control of anti-hyperglycemia licensing in developing countries is desperately needed. Such efforts can achieve more satisfactory outcomes in clinical trials.

Insulin and insulin-derivatives

Insulin and insulin-derivatives are the safest anti-hyperglycemia options and can be used in both type I and type II *diabetes mellitus* patients [1]. But it also has some deficient. The most conspicuous one is that needs needle injection every day, which leads to treatment inconvenience and burden for patients. Currently, oral intake of drugs is the most welcoming drug administration options for patients. Thus, some small-molecular chemicals having the insulin-configurations or insulin receptors binding activity might be potential oral anti-hyperglycemia drugs for surrogating insulin or insulin-derivatives. In future, we can compare, simulate and calculate insulin-configurations or insulin receptors binding activity from large-pool of small-molecular chemicals by computing or experimental work. If this type of researches can help our finding new chemicals, we might produce, develop and license insulin-like small-molecular drugs for oral intake.

Helping diabetes mellitus patients do more exercise in company with proper anti-hyperglycemia treatments

Helping *diabetes mellitus* patients do more exercise along with proper treatments is a proved good way. In previous work, large body of publications shows that proper exercise is very useful for control of hyperglycemia [3,5]. Furthermore, we shall encourage more *diabetes mellitus* patients to do more exercise. Exercise in *diabetes mellitus* patients is as equal importance as drug hyperglycemia control.

To test and study some new initiatives

To test and study some new initiatives such as Propolis is also good options [6]. Propolis is bee extracts of waxy-like and other components. It has been discovered for anti-bacterial, anti-fungal or anti-tumors. In China, it has been licensed as healthy-promoting agents. Now it has been largely sold for treatment of *diabetes mellitus* and received widely acclaiming for its efficacy in China, produced by Zhi Feng Tang company, the most successful company. Some similar initiatives should be cooperated, testified and verified by more experimental, preclinical or clinical investigations world-wide.

Future direction

Until now, *diabetes mellitus* is still a refractory and chronic disease that needs further mechanism and therapeutic study and brainstorm of current and future treatment options. In future, we should firstly seek for efforts and solutions to update *diabetes mellitus* treatment arsenals and more pathogenesis, experimental pharmacological mechanisms of action, translational and clinical studies are welcomed in order to make *diabetes mellitus* treatment in low toxicity and high efficacy manners.

Genetic or genomic study of mechanisms of disease progression and drug actions and toxicities starts to show its potentiality. Different individuals and populations can show different disease progressions of *diabetes mellitus* and is also one type of pharmacogenetic or pharmacogenomic research body [7]. The prime aim for pharmacogenetic or pharmacogenomic study is given patients their best-suited drug recipe and dosage. It is one of the fastest development scientific disciplines by entering this millennium. But it is a system based on licensed drugs. So furthermore, we need to create or develop more effective and safe anti-hyperglycemia drugs that can be used for long terms, or even cure *diabetes mellitus* patients quickly and completely. Only we pay more attentions on drug safety and development of new effective drug that can make it different or finally not face them so baffled and helpless (Table 1).

Possible future roadmap for updating anti-hyperglycemia study
Development and production of more effective and low toxicity anti-hyperglycemia drugs
To deepen fundamental and comprehensive mechanism study to make licensed anti-hyperglycemia drugs more reliable
Genetic study of mechanisms of disease progression and drug actions and toxicities along with different individuals and populations.
To test and study some new initiatives such as Propolis
To set a more rigorous toxicity baseline for control of anti-hyperglycemia licensing in developing countries, or even to developed countries.
To find some small-molecular chemicals for simulate insulin functions and receptors-binding

Table 1: Possible future roadmap for updating anti-hyperglycemia study

Conflict of Interests

Authors declare there is no conflict of interests with other institutes and academies. Authors are not received any funds for this discipline of experimental or clinical studies.

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