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Biomedical Journal

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## Highlights

# Basal-bolus or premixed? Shedding light on optimal insulin regime for type 1 diabetes

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### ARTICLE INFO

#### Article history:

Available online 18 January 2019

#### Keywords:

Type 1 diabetes  
Insulin  
Basal-bolus

### ABSTRACT

In this issue of the *Biomedical Journal*, we highlight original research that will help to guide the choice of insulin administration regimes for children with type 1 diabetes. We also investigate whether a common medication for attention deficit/hyperactivity disorder worsens sleep problems among these children, and discover a new approach to maximize the lifetime of a fragile piece of surgical equipment.

## Spotlight on original articles

Daily insulin injections are a fact of life for children living with type 1 diabetes (TD1). In this issue of the *Biomedical Journal*, Chou et al. [1] examine a long history of cases of TD1 to determine whether different injection/dosing regimes influence the risk of developing serious complications of the disease.

Around two in every 1000 children in the developed world are living with TD1 [2]. Different insulin regimes exist for managing the condition, involving injections with various insulin analogs at different times and frequencies. Guidelines from the National Institute for Health and Care (NICE) recommend a basal-bolus type regime, involving insulin injections at each meal to mimic the normal delivery of insulin, coupled with an injection of a longer-acting form of insulin to stabilize blood glucose levels during fasting periods [3]. However, four or more daily injections of insulin can be inconvenient in young children, and other regimes exist to limit this burden. Premixed insulin regimes contain both short

and intermediate acting insulin, and as such may be given in only 2–3 injections per day.

One of the most serious complications of TD1 is diabetic ketoacidosis (DKA), which occurs when severe insulin deficiency leads to excessive fat breakdown and the build-up of ketones in the bloodstream. The incidence of DKA in children and young adults is around 5% [4], and the condition may be fatal. Yet, it is not really known whether different regimes of insulin administration affect the incidence of DKA, because the issue is not possible to address in a prospective study. To shed light on the issue, Chou et al. [1] carry out a large retrospective review of patients with TD1 recorded in a Taiwanese registry.

Examining cases from a 14 year period, Chou and colleagues identified 273 young (<20 years old) patients taking a premixed regime and 552 patients taking a basal bolus regimen. After matching patients for demographic characteristics, each group contained 226 patients. The incidence of DKA was significantly higher in the premixed regime group (10.6%) than in the basal-bolus group (5.3%). In the premixed group, six of these events occurred within the first month of

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Peer review under responsibility of Chang Gung University.

<https://doi.org/10.1016/j.bj.2018.12.008>

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regime use (versus zero in the basal-bolus group). Likewise, the premixed group experienced significantly more episodes of severe hypoglycemia and overall showed poorer glycemic improvement, as measured by HbA1c levels.

NICE guidelines do not specify whether various insulin regimes alter the risk of DKA [5]. However, the study of Chou et al. reveal that patients receiving a basal-bolus regime are at less risk of DKA or severe hypoglycemia than those receiving a premixed regime. These findings are consistent with previous reports that found that HbA1c levels are higher in young diabetics treated with premixed insulin [6,7], which is a risk factor for DKA. Given that a large proportion of cases of DKA in young diabetics occur because of missed injections, these findings may be explained by the lower frequency of injections in the premixed regime: missing just one injection in the regime would expose patients to a long period of insulin deficiency, thus increasing the risk of DKA. Although these findings advocate basal-bolus as the treatment of choice, education about the strict adherence to a regime, regardless of its nature, should enable therapy to be individualized to each patient's needs.

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## Also in this issue

### Original articles

#### *Plant extract limits liver damage induced by chemotherapy in rat model*

The chemotherapy agent Adriamycin, also known as doxorubicin, is used alone or in combination for the treatment of several cancers. One of its major side effects is hepatotoxicity, brought about by its accumulation in the liver and production of reactive oxygen species [8]. In this preclinical study, Mohebbati et al. [9] examine whether extracts from *Zataria multiflora* (ZM), which is known to have antioxidant properties [10], alleviate the toxic effects of Adriamycin on the liver. Their findings suggest that the major ingredient of ZM, the monoterpenic phenol Carvacol, significantly limits oxidative stress-related damage to the liver in rats treated with Adriamycin.

#### *Does common ADHD drug cause sleep problems?*

According to their parents, children with attention deficit/hyperactivity disorder (ADHD) often experience sleep problems [11,12]. Treatment with the common ADHD medication methylphenidate (MPH) has been reported to exacerbate these sleep problems [13], but other studies have failed to find a connection [14]. Here, Chin et al. [15] explore how the regular use of MPH over 6 months affects sleep in children with ADHD, based on both objective measurements from polysomnography and subjective observations from parents. Their findings highlight a discrepancy between what parents perceived and sleep quality measured by polysomnography, which may be the source of the inconsistency of the literature. Moreover, MPH did not appear to worsen sleep problems in children with ADHD, based on polysomnography measurements.

#### *Optimizing exercise types for high performance athletes*

To optimize training regimes among athletes, it is important to understand the biochemical effects of various

exercises on muscle tissue. Here, Isik and Dogan [16] investigate markers of skeletal muscle injury and fatigue from blood samples of healthy male athletes performing either bilateral or unilateral lower body resistance exercises. They report that bilateral exercises cause more muscle fatigue than unilateral exercises, suggesting that the performance of unilateral exercises may reduce recovery times.

#### *Ultrasound features to improve diagnosis of wry neck*

Torticollis or “wry neck” is a problem of the neck muscles that causes the head to tilt down. When present from birth, the condition is termed congenital muscular torticollis (CMT) and frequently involves the sternocleidomastoid muscle, one of the largest muscles in the neck. It can be categorized into one of four different types on ultrasound, but this diagnosis involves the subjective assessment of images by an expert physician. The analysis performed by Lin et al. [17] in this issue identifies certain quantitative features on ultrasound images that may facilitate the proper, and more objective, classification of CMT.

#### *Testing of a weight control intervention among semi-conductor workers*

Lin et al. [18] investigate the effectiveness of a workplace weight control intervention among semi-conductor workers, which due to the stressful nature of their job, are at high risk adverse health effects. In a study involving more than 900 participants, Lin and colleagues find that the combination of both diet and exercise interventions are required to achieve weight loss among such workers, although the effectiveness of these interventions may be limited by alcohol consumption and cigarette smoking.

#### *Maximizing the lifetime of surgical equipment*

The introduction of flexible ureteroscopes has marked a new era in urology, enabling kidney stones to be removed without highly invasive surgery. However, flexible ureteroscopes are expensive and prone to damage, and must be repaired as often as every 6–15 procedures [19]. Here, Lin et al. [20] describe a novel operative technique that extends the durability of flexible ureteroscopes to up to 30 procedures before any repair is needed.

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## Correspondence

### *Comment on the anti-tumor effects of licochalone A*

Yan et al. [21] highlight an interesting report by Chen et al. [22] detailing the mechanism of action behind the anti-tumor effects of licochalone A, and notably its effect on a specific microRNA.

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## Conflict of interests

The author declares no conflict of interests.

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