

Mini Review

Volume 5 Issue 5 – February 2018
DOI: 10.19080/CRDOJ.2018.05.555673

Curre Res Diabetes & Obes J

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Historical Background of Dietary Management For Children with Type 1 Diabetes



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Submission: January 18, 2018; **Published:** February 12, 2018

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Introduction

The age of dogmatic diets without scientific evidence

Diet has traditionally played an important role in diabetic therapy. Before the discovery of insulin, a restrictive diet, yielding more or less positive results in 80% of diabetic subjects, was the only therapy available. Later, it became evident that diet, as such, is the ideal treatment for obese diabetics of middle age (now called type 2 diabetes that is beginning, however, to be encountered in children and adolescents with the rising rate of obesity [1]) since the problem is not based on a lack of insulin. In children and adolescents, diabetes is most often associated with a genetically determined predisposition, the presence of autoimmune markers, aggressive beta-cell destruction leading to severe insulin deficiency (type 1 diabetes), and the urgent need for insulin replacement therapy. Until insulin was made available, a diagnosis of diabetes in children was a death sentence within weeks or months. Many researchers had tried to isolate insulin from animal pancreas. In 1921, the Romanian Nicolae Paulescu, who studied pancreatic secretion in Paris, developed an aqueous pancreatic extract that was injected into a diabetic dog, reducing hyperglycemia and ketonuria. Paulescu published his experience, in perfect French, in the August 1921 issue of the Archives Internationales de Physiologie [2]. In 1922, Canadians Frederick Banting and Charles Best, under the direction of Macleod, with the help of the biochemist James Collip, have prepared clearer insulin free from impurities. This extract was injected successfully to Leonard Thomson, a ketotic diabetic child aged 14 years [3]. He died in 1935. The 1923 Nobel Prize in Physiology and Medicine was attributed to the Canadian team, ignoring the pioneering work of Paulescu.

Over the years, various diets have been proposed often without scientific evidence. Restriction in calories, carbohydrates, or lipids was advocated, but also a high intake of the same nutrients or of proteins. "Free diet" as well as "anarchic" eating habits as opposed to "restricted" and "weighed" diets (thanks to a scale or "exchange lists") have been proposed [4,5]. A total

caloric restriction inhibits growth and, associated with a lack of insulin, leads to the Mauriac syndrome [6].

One of the main errors was (is!) to speculate that there exists a direct linear correlation between the injection of x units of insulin and the utilization of y grams of glucose [7]. If it was true, one should give more insulin to practice physical activity! In reality, it is the reverse! The reason is that the affinity of the muscular insulin receptors, as well as the activity of GLUT-4, is increased during (and even after) muscular work, but it is not the case for the hepatic insulin receptors. Moreover, the regulation of glucose is dependent on a number of factors such as counter-regulatory hormones, gluconeogenesis, the relative use of glucose and non-esterified fatty acids as energy for muscular exercise, psychological factors (stress), and other mechanisms which are beyond our control [8,9]. It has been shown that a decrement in glucose per se or a signal elicited by a moderate decrement in glucose, but largely independent of glucagon and hepatic catecholamine action, stimulates glucose release from the liver during exercise [10].

Alas nowadays carbohydrate counting, even if disputed [11], is still widely used without proving best HbA1c levels [12].

Evolution to a normal and flexible diet

In the seventies, clinical studies by Henri Lestrade in France [13], and by our group in Belgium [14], have demonstrated that diabetic children, receiving an adequate and flexible dose of insulin according to self monitoring of urine glucose at that time, benefited from a normal "spontaneously balanced and adapted diet". The best glycemic control was not obtained by totally free or rigid diets, but by appropriate daily adjustments of insulin and adequate distribution of normal food intake [5,12]. Diabetic children have no fixed energy requirements because they grow and have variable physical activities. Energy intake may fluctuate from day to day without mandatory changes in the need for insulin or in the degree of glycosuria [13,14]. To impose

a weighed and measured diet is undesirable both for diabetic control and for psychological reasons. Moreover, the notion of “measuring” leads to rejection of the entire therapeutic regimen and to emotional problems. A restricted diet that controls only carbohydrate intake and thus favors fat intake is potentially dangerous for the vascular system. On the other hand, even in the seventies we had observed a too high fat consumption in Belgian diabetic children (42.2% of the total caloric intake) and we had to concentrate our efforts on emphasizing fat rather than carbohydrate restriction [15], which is the case in many industrialized countries [5]. We had also noted a positive correlation between the blood levels of HbA1c and those of total cholesterol and of triglycerides [16], which we confirmed later adding the LDL-cholesterol and apolipoprotein B [17]. There was no relationship between HbA1c and HDL-cholesterol or its subfractions [18]. This was confirmed by other studies [19]. This means that lipid abnormalities are not necessarily related to a diet high in saturated fat, but are certainly related to HbA1c levels.

Because the multicenter studies of the Hvidoere Study Group, performed in developed countries without financial restriction, show that treatment of childhood diabetes is inadequate in general and that levels of HbA1c are very different, diabetes treatment teams should individually explore the reasons for failure, without any prejudice or bias [12]. Our so-called “recipes” have been published elsewhere [5,12,20].

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DOI: [10.19080/CRDOJ.2018.05.555673](https://doi.org/10.19080/CRDOJ.2018.05.555673)

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