

# Gazing into the future – the next 100 years. Perspectives from diabetologists

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Gazing into the future, into the next 100 years, to consider the possibilities of what might emerge to improve the management of diabetes is a challenging task. Nevertheless, we thought that diabetologists should consider the matter alongside the contributions from industry, people living with diabetes and the outgoing YDEF chair. The task is shared here by a very senior diabetologist (REJR, #Iwasthere) who was present at the inaugural meeting of ABCD in 1997,<sup>1</sup> a younger but well established diabetologist who founded the ABCD Diabetes Technology Network (EGW),<sup>2</sup> and a trainee diabetologist, ABCD research fellow and current chair of Young Diabetologists and Endocrinologists Forum (TSJC).<sup>3</sup>

## Type 1 diabetes

Considering the rate at which science, medicine and technology are all advancing, there are clues from how things are now, as presented in this supplement, to where management of type 1 diabetes (T1DM) might be 10, 20 and 30 years from now and beyond. There seems to be a strong possibility, indeed likelihood, that an immunotherapeutic solution will emerge that will stop T1DM occurring, as the progress outlined by Colin Dayan evolves to safer and safer medicines that are more and more effective.<sup>4</sup> Alongside this, the identification of high-risk individuals is likely to become increasingly accurate as our understanding of the immunology also improves. In the meantime, and for any who do not respond to immunological therapies or who are not detected in time, closed-loop systems are also likely to improve in safety and efficacy in our extreme technological age,<sup>5,6</sup> with the hybrid

closed loop replaced by the fully closed loop. It may be that future ultra-effective technology will involve dual-hormone fully closed loops,<sup>7</sup> and it is not impossible that safe and effective devices will be placed in the abdomen, in the portal system, to emulate natural physiology more closely. It is also possible that cell biology will advance to the stage where pancreatic islets that are not immunogenic to the patient can be grown in the laboratory and implanted, along the lines of current islet cell transplantation techniques.<sup>8</sup> The work described by Kevin Docherty concerning reprogramming pancreatic tissue might also advance considerably as medical science continually moves forward.<sup>9</sup> As the science of cell engineering continues to progress, there may be solutions to the abnormalities of T1DM that we cannot even imagine at this time.

## Type 2 diabetes

We are in a worldwide pandemic of diabetes and obesity which seems set to worsen.<sup>10</sup> We can but hope that as the decades pass of the next hundred years, improving equality of living standards worldwide, abolition of poverty, universal education, improving food quality and understanding about healthy eating and lifestyle will, for the first time since the IDF started measuring, slow down the pandemic. In the meantime, we know from the ground-breaking work outlined by Roy Taylor in this supplement,<sup>11</sup> that we now have low-calorie diet programmes that can reverse totally the metabolic abnormalities associated with type 2 diabetes (T2DM) if applied early in the course of the disease. With regard to medications, GLP-1 receptor agonists have been increasing in effectiveness in terms of reducing weight and improving the metabolic abnormalities of T2DM,<sup>12</sup> and it seems probable that this trend will continue. It is already clear that tirzepatide, which binds to both the GLP-1 and GIP receptors, will soon be available to prescribe; it is an order of magnitude more effective than current GLP-1 receptor agonists, with commentators stating that the impact of tirzepatide is equivalent to that of bariatric surgery.<sup>12</sup> It seems likely that, with the passage of time, medical science will improve further in its understanding of the factors involved in appetite control and that increasingly effective medications will emerge. For those who continue to struggle with obesity and sub-optimal glycaemic control despite maximised medications, it seems likely that increasingly safe and effective endoscopically applied devices will emerge, learning from the already established effectiveness of EndoBarrier.<sup>13</sup> Barbara McGowan in this supplement describes effectiveness of current surgical interventions,<sup>14</sup> and it is probable that these will become increasingly safe, effective, and available.

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## Key messages

- 100 years is a long time. Medical science and technology are advancing at a great and accelerating pace, so the changes in diabetes management are likely to be considerable – and are difficult to predict beyond the next decade
- An immunotherapeutic solution to type 1 diabetes seems likely, obviating the need for insulin for most patients, with advanced technology as a back-up, utilising full closed-loop technology. Dual-hormone devices are likely, perhaps implanted in the abdomen, in the portal system, to be more physiological. Cell biological solutions are also likely to develop more and more
- In type 2 diabetes, we can but hope for worldwide improvements in living standards, food production and education to slow down the worldwide diabetes pandemic. Extensive roll out of low-calorie diet regimes to reverse early-onset type 2 diabetes is likely
- Medical science will probably increase further in its understanding of the factors involved in appetite control and increasingly effective medications will likely emerge, the process starting with further development of agents which bind to both the GLP-1 and GIP receptors. It is also likely that increasingly safe and effective endoscopically applied devices will emerge, and surgical interventions will improve and become more widely available

## Other types of diabetes

Precision medicine may also hold the key to optimising diabetes in future. T1DM and T2DM may become things of the past due to the recognised significant heterogeneity between people with the same type of diabetes, building on the work of such as Andrew Hattersley and Emma Ahlqvist.<sup>15,16</sup> Recognition of the various underlying genetics, immunology and phenotypic features may allow us to personalise the approach to managing diabetes of all types and improve the quality of life of all people with diabetes.

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