sugar over a 5-year period. These data confirmed previous studies which disclosed that the success rate in managing diabetes with tolbutamide at the end of 5 years was only 13 percent.

Mr. GORDON. Dr. Chester, what precisely does the 13 percent represent? Does it mean that in only 13 percent of the cases was the tolbutamide successful in lowering blood sugar at the end of 5 years?

Dr. CHESTER. At the end of 5 years. There may be early success if one measures levels of blood sugar. This is called primary failure. That is, there is no response within 1 month. In effect blood sugar levels are not at the range that one desires within that period. Then there are secondary failures in patients who initially appear to respond. Again, this is determined by levels of blood sugar. Subsequently, over each year there are more and more called secondary failures, so that by the time the 5-year period arrives, at least in this study, only 13 percent were still responding.

Therefore, we have a drug with limited effectiveness that progressively loses its effectiveness.

Mr. GORDON. Well, there is no evidence that lowering blood sugar prevents the vascular complications resulting from diabetes. Is that not correct?

Dr. CHESTER. Yes.

Mr. GORDON. Then, what are we actually accomplishing when we lower blood sugar?

Dr. CHESTER. Well, we do accomplish a variety of things. If the blood sugar level becomes excessive, then the amount of urine, salt, et cetera, are passed out into the urine, and the patient not only loses tremendous amounts of water and becomes dehydrated, but may suffer from some of the loss of the electrolytes.

Second, continuation of poorly controlled diabetes, again measured by levels of blood sugar, may be followed by a variety of very serious manifestations. One is diabetic ketoacidosis, where presumably, because of lack of insulin and other factors, large amounts of the fat are broken down, mobilized, converted to a number of substances known as ketone bodies. As these substances accumulate, the patient may become unconscious and death may follow.

There is a comparable state in which the blood sugar reaches extremely high levels, perhaps in the range of 1,000 or above, where extreme loss of water becomes critical. These patients may become unconscious and die within a relatively short period of time if not treated adequately.

There is also the question of whether or not keeping blood sugar at given levels will prevent infection. This is difficult to document. What we do know, however, is that the individual with diabetes who develops infection, unless we treat the diabetes vigorously and simultaneously treat the infection, the patient is likely to suffer and may die.

So, there are reasons to try to reach given levels of blood sugar. The difficulty is that in general no one of us knows what the optimum level may be. It is extremely difficult to restore the blood sugar levels to those that supposedly normal people would carry throughout the day without the risk of developing extremely low blood sugar or hypoglycemia, which in turn may damage the brain and cause other problems.