



PIC QUESTION OF THE WEEK: 10/10/05

Q: What are the major effects of fluoroquinolones on blood sugar?

A: Hypo- and hyperglycemia may occur in diabetic and non-diabetic patients receiving fluoroquinolones. Similar changes in blood sugar can be observed in many patients, irrespective of their use of fluoroquinolones. Risk factors for hypoglycemia in non-diabetic patients include older age, liver disease, malignancy, low plasma albumin concentration, increased serum creatinine, and chronic heart failure. The degree of hypoglycemia associated with fluoroquinolones is variable and probably dependent on a number of patient characteristics. Most reports of fluoroquinolone-induced changes in blood sugar are associated with hypoglycemia; however, episodes of hyperglycemia have been documented as well. The following cases illustrate the different effects that fluoroquinolones may exert on blood sugar. A 68-year-old woman with diabetes receiving glyburide was admitted to the hospital for progressive congestive heart failure. She was prescribed gatifloxacin empirically for a suspected urinary tract infection. Within 24 hours, she became hypoglycemic and her capillary blood glucose remained between 70 and 80 mg/dL for two days despite intravenous glucose and discontinuation of glyburide. Gatifloxacin was discontinued on the fifth day and her blood glucose increased to greater than 200 mg/dL. It returned to acceptable levels upon re-institution of glyburide. The mechanism by which fluoroquinolones induce hypoglycemia is not completely understood, but may be based on their ability to non-specifically stimulate various cell receptor sites. It is believed that adenosine triphosphate-sensitive potassium channels (K_{ATP}) exist in pancreatic β -cells and are vital to insulin modulation. Closure of these channels by sulfonylureas and, to a lesser extent, fluoroquinolones, results in an efflux of insulin and resultant decreases in blood glucose. Combination use would thus seem to increase the potential for producing hypoglycemia. The opposite scenario is described in a 91-year-old woman with no history of diabetes who presented with an exacerbation of COPD. Forty-eight hours after she received prescriptions for prednisone and gatifloxacin, the patient was admitted to the hospital for treatment of non-ketotic hyperglycemia (>1000 mg/dL). Previous use of prednisone had not been associated with any increase in blood sugar. Currently, there is no proposed mechanism for the elevated blood sugar occasionally seen with these antimicrobials. Changes in glucose homeostasis have been reported with gatifloxacin, moxifloxacin, levofloxacin, and ciprofloxacin. Product literature indicates the frequency of these events is $<2\%$. Some authors believe hypoglycemia occurs more often with gatifloxacin than levofloxacin, while other studies suggest the frequency of this event is similar. Alterations in blood glucose must be considered in all patients receiving fluoroquinolones, especially those with existing risk factors.

References:

- Owens RC. Fluoroquinolone-associated dysglycemias: a tale of two toxicities. *Pharmacotherapy* 2005;25:1291-5.
- Biggs WS. Hypoglycemia and hyperglycemia associated with gatifloxacin use in elderly patients. *J Am Board Fam Pract* 2003;16:455-7.