LETTERS TO THE EDITOR

Accumulation of Radioiodine in Staff Members

In our personnel monitoring program we recently found amounts of radioiodine greater than 40 nCi in the thyroids of staff members handling therapeutic radioiodine for our thyroid-cancer patients. Investigation has shown that this occurs when Mallinckrodt’s therapeutic radioiodine has been used, but not with Squibb’s. The pH of the preparations (Mallinckrodt 2-4, Squibb 7.5-9) suggests that possibly the more acidic Mallinckrodt preparation creates a more favorable milieu for volatilization of the iodine. A few studies were prepared using a sodium sulfite wick held over the vial of the therapeutic I-131 when opened in a hood. The wicks used for testing demonstrated that the Mallinckrodt dose gave significantly more cpm/mCi than those used for testing the Squibb preparation. Correction was made for total activity in the vial; otherwise the tests were performed similarly.

These preliminary but potentially significant observations have been reported to both companies. Representatives have corroborated the difference in pH and its potential effect on volatilization. Dr. Tusing, Medical Director of Mallinckrodt, Inc., has also stated that they are “in the process of reformulating this product, and actually have stability studies underway.” It seems important to share these observations with the nuclear medical community.

GEORGE L. JACKSON
FRANK MACINTYRE
Harrisburg Hospital
Harrisburg, Pennsylvania

Reply

In response to a report of thyroid radioactivity observed in technologists who administer sodium iodide I-131 therapy solution, Mallinckrodt has reformulated its product in order to reduce the I-131 volatility of this solution (1). The majority of the assimilation of I-131 by the technologists most likely results from inhalation of I-131 contained in vapors that are discharged from open vials of the drug during preparation or administration of the dose (2). In the reformulated product, Mallinckrodt has achieved a reduction of volatility by a) changing the antioxidant to sodium bisulfite, which prevents oxidation of the iodide ion to volatile forms of iodine; b) adding a disodium phosphate buffer to maintain an alkaline pH (7.5 to 9.0), thereby minimizing formation and volatilization of hydrogen iodide; and c) including a chelating agent (disodium edetate), to prevent catalytic oxidative reactions induced by metal ions. This formulation has been tested for volatility and compared with the previous formula under identical test conditions. Although volatility rates vary somewhat with the handling and storage conditions of the radiiodine solutions, the formulation generally shows volatility rates in the order of 1/20th to 1/30th that of the previous formula.

While the improved formulation has substantially reduced the volatility rate of I-131, it should be recognized that it is still essential that any radiiodine solution be handled, dispensed, and administered in accordance with recognized safe handling practices (3). The radiiodine solutions should not be stored above room temperatures, and extreme care should be taken to avoid inhalation of vapors emanating from open containers. Strive to minimize the frequency of opening radiiodine sources and, once opened, keep the time as short as possible. It should also be mentioned that unusually high levels of airborne I-131 have been found in the vicinity of patients treated with the drug (4,5). These patients were found to expel radioiodine in their breath within 5 min of receiving the dose. Therefore, technologists and nursing personnel should be instructed to avoid any unnecessary or prolonged contact with therapy patients.

We believe that the volatility reduction achieved by this improved formulation will greatly reduce the likelihood of technologists assimilating I-131 while handling and administering Mallinckrodt’s therapeutic radioiodine solution, especially when proper handling and safety procedures are followed.

R. G. WOLFANGEL
Mallinckrodt, Inc.
St. Louis, Missouri

REFERENCES


Re: Tables to Estimate Total Binding Capacity of Thyroxine-Binding Globulin from the in Vivo Thyroid Function Tests

In a recent technical note in this Journal (1) Alfredo Cuarón and Christina Happé de Cuárdon gave a number of tables with which the physician can take full advantage of two routine laboratory determinations that provide information related to four important physiologic parameters: total and free thyroxine concentration (TT4, FT4) in serum, and total and free TBG binding capacities in serum. In these tables a number of different units were used for the same entity. For serum TT4 they used the following units: mg/100ml (Table 1) and μg/100ml (Table 2); for serum FT4, mg/100ml (Table 1), μg/100ml (Table 2B) and ng/100ml (Fig. 1); for TBG, mg T4/100ml (Table 1) and μg T4/100ml (Table 2). We think the right units are μg/100ml (serum TT4), ng/100ml (serum FT4) and μg T4/100ml (total TBG). In addition the subscription of both figures appears to be exchanged.

Nevertheless we agree with their conclusion that the concentration of FT4 is the most specific and sensitive test for thyroid dysfunction, especially when used in combination with the concentration of TT4.