Disposal of Mercury in Chloride-Reagent Waste

To the Editor:
Chloride is commonly assayed in the clinical laboratory with a mercuric thiocyanate reagent. For example, the Technicon chloride color reagent for the SMA 6/60 contains 400 mg of Hg per liter (ppm), and the waste solution contains 130 mg/L (confirmed by analysis), generated at the rate of 300 mL/h. In our laboratory we accumulate 60 L of waste per month, containing almost 10 g of Hg. It is undesirable to allow such quantities to escape into the environment, but the volume of waste and its liquid nature make its safe disposal difficult.

Technicon advises precipitation of the mercury with thioacetamide, followed by filtration. Thioacetamide is a potent carcinogen and should not be used in the clinical laboratory, nor should thioacetamide-containing filtrates be released into the environment.

Pragy (1) suggests treatment with NaOH, Na2CO3, and metallic zinc, resulting in 99% precipitation of the mercury. For starting concentrations greater than 100 mg/L he advises double treatment of the solution, a tedious procedure. In any case the final supernatant Hg concentration is of the order of 1 mg/L.

Present Environmental Protection Agency standards (2) allow no more than 2 µg of Hg per liter in effluent water. This would require a dilution factor of $6 \times 10^4$ for untreated waste or 500 for waste treated with metallic zinc.

Even distribution of the untreated waste throughout our hospital's total waste-water output of $8 \times 10^6$ L per month would result in an Hg concentration of 1.2 µg/L, uncomfortably close to the present guidelines.

I have adapted the method of Hautala and MacDonald (3) to the treatment of laboratory waste and consistently obtain residual Hg concentrations of <10 µg/L. Waste is collected, and placed in a 30-gallon (120-L) plastic trash bin lined with a heavy-duty polyethylene garbage bag. When 100 L accumulates, a solution of 300 g of technical-grade NaOH and 350 g of technical-grade (60%) Na2S in 2 L is added, and the mixture is stirred thoroughly. The final pH of the mixture should exceed 7.0. After 48 h to one week, the supernate is removed with a water aspirator (ensuring dilution). Completeness of precipitation can be checked by adding a few drops of Na2S solution to the supernate.

The black sludge residue (2–5 L) is removed with the garbage bag and disposed of with other solid toxic waste. The residual supernatant concentration of three consecutive batches of waste treated this way has been 8.9, 5.0, and 10.0 µg/L. The procedure may be scaled up or down as desired, and the mixture can be filtered rather than allowed to settle. This is convenient for relatively small volumes.

Reagent cost at current prices is $5.00/100 L compared to $17.00/100 L for Pragy's method. The procedure should be carried out in a fume hood or in a well-ventilated area, because the odor of H2S is detectable for a few minutes after the reagents are added.

References

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Alterations of Serum Glycoproteins—Possible Biologic Markers of Tumor-Host Responsiveness

To the Editor:
In keeping with the continuing interest in identifying useful biologic markers of malignancy, exemplified by the paper by Silverman et al. (1), I thought that some observations of alterations in host cellular and clinical responsiveness in association with alterations of serum glycoproteins after cryosurgical ablation of tumor would be of further interest.

Patients with prostatic carcinoma have significantly increased α2- and β-globulin concentrations (2), which both in magnitude and frequency among such patients increase as the malignancy increases (3). Alterations in the concentrations of these and other serum proteins (4) have also been noted after cryo-prostatectomy (4, 5). Particularly striking has been the association between alterations of α2-globulin and clinical responsiveness (4).

In addition to the recent alterations in glycoproteins in the α2- to β-globulin regions after mastectomy noted by Silverman et al. (1), there are similar observations of a correlation between favorable clinical response and alterations in α2-globulins in patients with gastric (6), ovarian (7), or renal cell (8) carcinomas after chemotherapy.

As previously suggested (3), measurement of concentrations of α2-globulins, although not pathognomonic for prostatic cancer may, pending confirmation, be of prognostic value as an indicator of the clinical stage of malignancy, once the diagnosis has been made. In addition, it may provide an objective criterion for monitoring the clinical response.

Prompted by alterations in α2-globulins in association with a favorable response to chemo- or cryotherapy and studies demonstrating the suppressive effect of an as-yet-unidentified factor (antigen?) migrating in the α2-globulin fraction of serum cell-mediated immunologic responsiveness in prostatic cancer patients (9), our preliminary investigation of alterations in the suppressive properties of serum before and after cryo-prostatectomy has recently been reported (10).

Using two suggested in vitro correlates of cellular responsiveness, phytohemagglutinin-induced lymphocyte blastogenesis and inhibition of leukocyte migration, we saw evidence of a reduction in the suppressive properties of serum accompanied by a concomitant reduction in the concentration of α2-globulin in six of eight patients after cryosurgery. Clinically, four patients had a favorable response (2) and two poor

\(^1\) Significant decreases in albumin and α2- and β-globulins and increases in α1- and γ-globulins from their pre-cryo-prostatectomy levels have been observed (4, 5).

\(^2\) Favorable response: symptomatic improvement, feeling of well-being, and palliation of pain expressed by the patient; diminution in the size of the initial primary tumor as determined by palpation, cystoscopy, or cystourethrogram; and (or) regression of metastases as determined histologically or roentgenologically.