

## Preventive Method for Possible Explosion of Used Ammoniacal Silver Nitrate Solution

—Treatment of waste fluid derived from histopathological staining—

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**Abstract:** The ammoniacal silver nitrate solution has been routinely used widely for the purpose of staining of reticulum fibers. However, the used ammoniacal silver nitrate solution may cause explosion due to formation of blackish silver fulminate ( $\text{AgONC}$ ) in the solution. This possible danger could be prevented by addition of an equal volume of the used sodium thiosulfate into the used ammoniacal silver nitrate solution.

*Key words:* Ammoniacal silver nitrate solution, Preventive method for explosion.

The innumerable modification procedures for the staining of reticulum fibers (Fig. 1 and 2) have been designed by using ammoniacal silver nitrate solution which was originally introduced by Bielschowsky (1904). This solution widely used for the routine staining of reticulum fibers. At present ammoniacal silver nitrate solution became very common reagent for the staining of reticulum fibers.

In our laboratory faced to the west, the used ammoniacal silver nitrate solution stored on the shelf of the laboratory bench caused an explosion three times in the past ten years. Therefore, we have developed the preventive method of an explosion of the ammoniacal silver nitrate waste as reported preliminary (Senba and Itakura, 1981; Senba, 1983; Senba, 1984).

The used ammoniacal silver nitrate solution should not be discarded into drains because it may become a source of pollution. As shown in Fig. 3, it is apparent that

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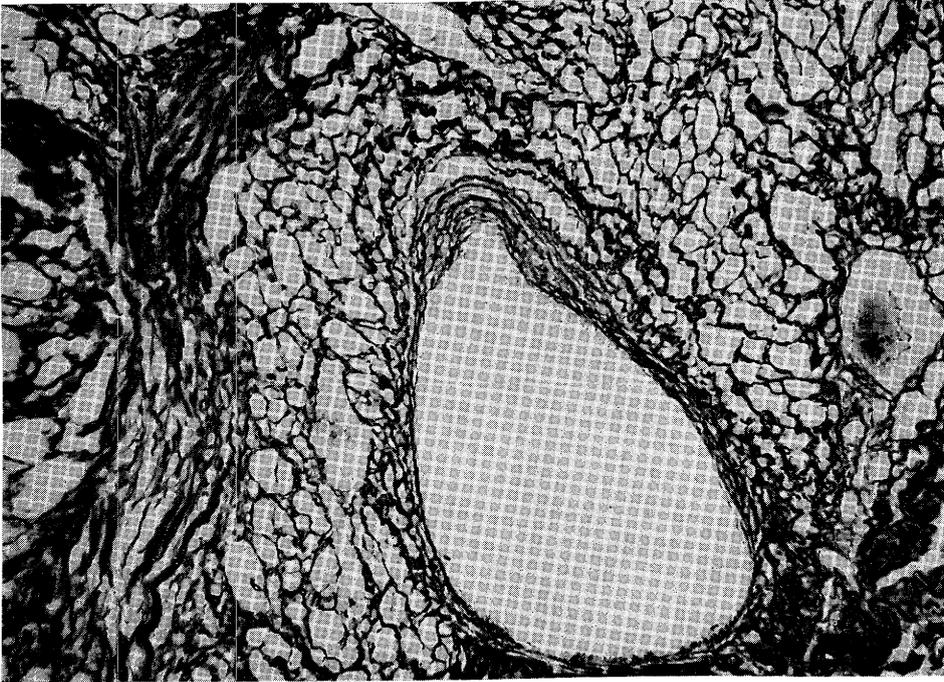


Fig. 1. Reticulum fibers demonstrated in the cutaneous type of Kaposi's sarcoma. Silver impregnation method (Senba, 1983), X400.

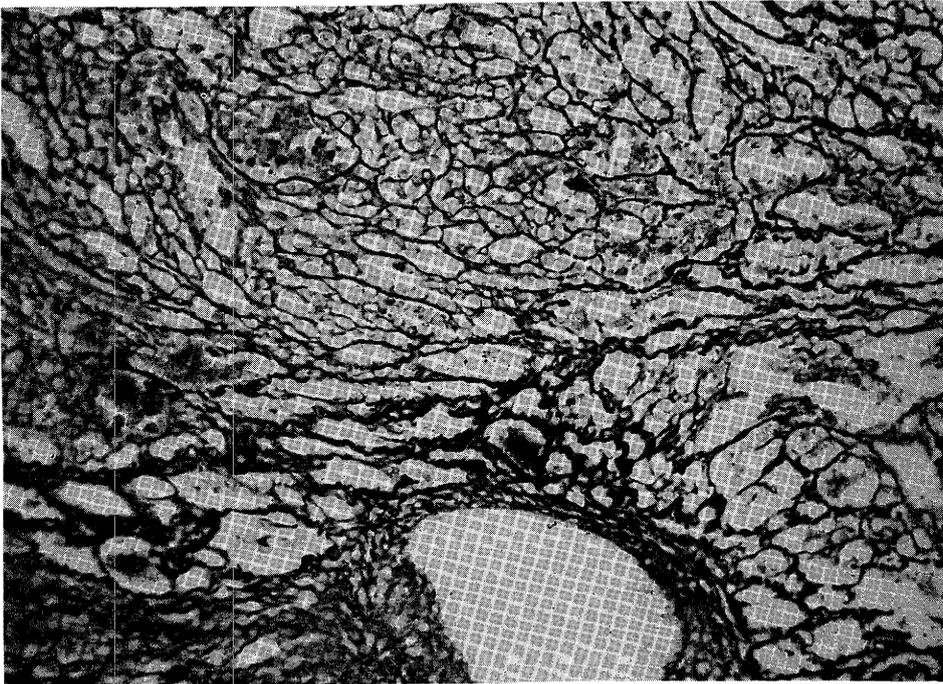


Fig. 2. Reticulum fibers demonstrated in the cutaneous type of Kaposi's sarcoma. Iron deposits are seen in the sarcoma tissue. Silver impregnation method (Senba, 1983), X400.

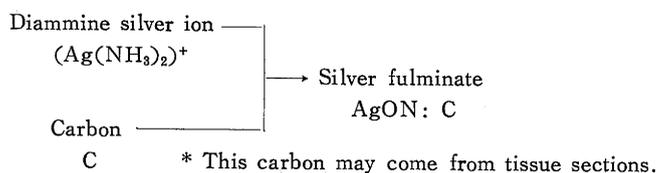


Fig. 3 Mechanism of silver fulminate formation. Diammine silver ion is not explosive, but silver fulminate is.

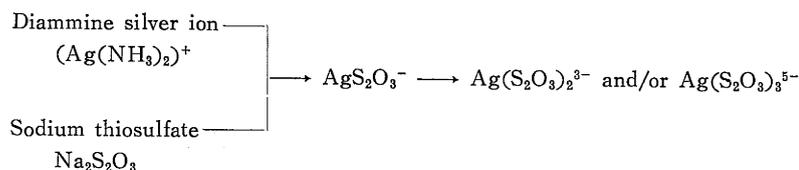


Fig. 4. Chemical reaction of converting used ammoniacal-silver nitrate solution into non-explosive solution.

the used ammoniacal silver nitrate solution may cause an explosion due to both the formation of the blackish explosive silver fulminate ( $\text{AgONC}$ ) by the aid of sunshine during storage (Editing Commission of Experimental Chemistry, 1954; Editing Commission of Encyclopedia Chemica, 1962) and a some triggering shock such as a small vibration.

Such explosion could be prevented by the addition of sodium thiosulfate ( $\text{Na}_2\text{S}_2\text{O}_3$ ), which accelerate the formation of stable  $\text{AgS}_2\text{O}_3^-$ ,  $\text{Ag}(\text{S}_2\text{O}_3)_2^{3-}$  and  $\text{Ag}(\text{S}_2\text{O}_3)_3^{5-}$  (Japan Society of Chemistry, 1973) as shown in Fig. 4. Fortunately, a sodium thiosulfate solution is used during the final step of the staining procedure, so that it is worthwhile to mix the waste containing sodium thiosulfate with the used ammoniacal silver nitrate solution. We do not needs to add fresh sodium thiosulfate solution at routine work.

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#### アンモニア性銀溶液の爆発防止法

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アンモニア性銀溶液は病理組織切片の細網線維染色のために世界に広く使用されている。しかしながら、組織染色に使用したアンモニア性銀溶液は黒色の雷酸銀が生成され爆発することがある。この危険は同染色に使用するチオ硫酸ナトリウムを等量、アンモニア性銀溶液の中に加えることにより爆発物質である雷酸銀の生成を未然に防止できる。

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