APPENDIX

The Equilibrium between the Disulphide Bonds in Wool and Mercaptoacetate

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One of us (O'Donnell, 1954) has shown that it is possible to approach complete reduction of the disulphide bonds in wool by successive treatments, each involving reduction with mercaptoacetate at pH 5.6 followed by alkylation of the SH groups produced. Since this was apparently effective because alkylation at each step removed one of the products, namely the SH groups in the wool, it seemed likely that the reduction reaction was in fact an equilibrium between two redox systems. In this event complete reduction of the disulphide bonds should be attainable either by removing the other product of reaction, namely biscarboxymethyl disulphide, or by greatly increasing the ratio of reducing agent to wool.

Wool (0.5 g., Merino 64's) was treated in an atmosphere of N₂ at 28° for at least 6 hr. with various amounts of mercaptoacetic acid buffered at pH 6.8–6.9 with 0.05 M-phosphate. The wool was then alkylated with iodoacetate at pH 8.0–8.5 and

analysed for S-S groups by the method of Leach (1959, 1960).

Table 1 shows that the extent of reduction of the disulphide bonds in wool can be made to approach completion either by increasing the concentration of reducing agent (Expts. 1 and 2) or by increasing the total amount of mercaptoacetate and replenishing it twice (Expt. 3) or four times (Expt. 4) to remove oxidation products. With the consecutive treatments of the wool only the last was followed by alkylation with iodoacetate. The results suggest that the extent of reduction is normally limited by an equilibrium between the S-S bonds and mercaptoacetate.

REFERENCES

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Table 1. *Extent of reduction of wool by mercaptoacetate*

Expt. no.	Concn. of mercaptoacetate (M)	Ratio of soln. to wool (ml./g.)	Disulphide remaining (μmoles/g. of wool)	Reduction* (%)
—	0	—	500	0
1	0.10	100:1	310	38
2	0.40	100:1	182	64
3	0.40	2000:1 (twice)	82	82
4	0.40	200:1 (four times)	55	88

* These figures are minimal since, in calculating the percentage reduction, it is assumed that no mixed disulphides between the wool and mercaptoacetic acid are left on the wool. With large excesses of reducing agent these products are less likely to be of importance.