

produced by the presence of extremely small traces of active substances including metallic ions is probably of great biological significance. The phenomena described are characterized by a sensitivity and specificity which is remarkably similar to that of many pharmacological actions. We wish to suggest that these methods may offer a means of approach, not only to the problem of the oligodynamic action of metals, but also to the elucidation of more general aspects of the action of drugs and the mechanism of photo-biological sensitization.

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March 16.

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¹ NATURE, 139, 367 (Feb. 27, 1937).

² Schulman, see Rideal, *Kolloid Z.*, 61 218 (1932).

³ Rideal, *Proc. Roy. Soc., A*, 155, 684 (1936).

⁴ Rideal and Mitchell, *Proc. Roy. Soc., A* (in the press).

IN a recent issue of NATURE, Myers and Harkins¹ directed attention to the possibility of considerable errors arising in experiments on monomolecular films where small quantities of ions are introduced from the glass vessel or the metal trough. Experiments which we have carried out recently at University College, London², show that corresponding errors may arise in the measurement of interfacial tensions as a result of the presence of minute quantities of ions in the distilled water. Thus when using ordinary laboratory distilled water, minima were obtained in the interfacial tension-concentration curves for sodium cetyl sulphate against various oils, the interfacial tension with 0.05 per cent sodium cetyl sulphate being several hundred per cent higher than the minimum which occurred at about 0.015 per cent. Similar results were obtained with sodium salts of other long-chain acids. On using very good conductivity water (specific conductivity 0.1×10^{-8} ohm.⁻¹ cm.⁻¹ or less) these minima were no longer found. The ordinary distilled water evidently contained small quantities of a cation which strongly depresses the interfacial tension of such systems, its effect being greater in the lower concentrations of long-chain salt.

The effect of salts in lowering the interfacial tension of oil against solutions of the salts of long-chain acids seems to depend primarily on the valency of the cation. Thus in a particular case (with 0.005 per cent $C_{17}H_{33}CON(CH_3)CH_2CH_2SO_3Na$) the concentration of salt required to diminish the interfacial tension from 6.25 to 1.0 dynes/cm. was 0.32 *N* sodium chloride, 0.003 *N* calcium chloride and 0.00005 *N* lanthanum chloride. The effect is independent of the nature of the anion, and is therefore analogous to the Schulze-Hardy rule for the precipitation of colloids. The influence of calcium salts has previously been observed by Harkins and Zollman with sodium palmitate³. In our experiments we have the same influence even when a long-chain acid with a soluble calcium salt is used.

On increasing the concentration of the salt the interfacial tension at first drops and then reaches a value which shows no further decrease. The higher the valency of the salt, the lower are these final values.

It would seem that the influence of the cation is in reducing the repulsion between the heads of the long-chain ions adsorbed at the interface, so allowing a closer packing in the interfacial film, with a consequent further lowering of the interfacial tension.

If our theory is correct, that the effect is primarily dependent on the valency of the ion with charge opposite to that of the long-chain ion, a corresponding effect, dependent on the valency of the anion, would be expected with such substances as cetyl pyridinium chloride adsorbed at the interface. Unfortunately, it was necessary to discontinue the research before this could be investigated.

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¹ Harkins and Myers, NATURE, 139, 367 (Feb. 27, 1937).

² Robinson and Selby, unpublished.

³ Harkins and Zollman, *J. Amer. Chem. Soc.*, 48, 69 (1926).

Acute Mercury Poisoning in a Respiration Chamber

IN the Laboratory of Zoophysiology we have a steel chamber of 27 cubic metres capacity, which is generally ventilated at a rate of 20 cub.m. per minute at pressures from the atmospheric down to 200 mm., corresponding to a height of 10 km.

In certain experiments it is used, however, without ventilation as a closed chamber in which the air is simply circulated, the oxygen supply being sufficient for two persons over twenty-four hours or more. In one such experiment, the effect of 4.5 per cent carbon dioxide had been studied over 19 hours without any symptoms beyond a pronounced hyperpnœa, but when it was desired to repeat this experiment and extend it over several days, the subjects became ill with bronchial irritation, violent coughing and severe headache after a few hours and had to break off.

In the night a few hours later, the condition became worse, with increased temperature, dyspnœa and nausea. After three days, a stomatitis affection supervened lasting two weeks, and the dyspnœa and fatigue by muscular exertion lasted for months.

Experimental animals (guinea pigs, rats and mice) were killed by the air in the chamber in 24-48 hours with severe pulmonary œdema.

A careful analysis showed that the symptoms were due to mercury poisoning from droplets spilled on the floor. Pulmonary symptoms became pronounced only when hyperpnœa was produced (by carbon dioxide), but in the absence of this the animals developed œdema and hæmorrhagia of the lower gut and died in three to four days instead of one to two days. When the air in the chamber was not artificially mixed, the animals would remain alive for several days more. Even when the chamber had been cleaned out and every visible trace of mercury removed, symptoms of mercury poisoning could still be produced in one to two weeks, and the last invisible traces had to be removed by long-continued ventilation.

It is evident that mercury in a non-ventilated or poorly ventilated room can become very dangerous, especially at high temperature, when the air is kept well mixed and when the subjects are breathing deeply, as with muscular work. It would appear that even in ordinary rooms in which mercury is spilled occasionally and can become finely divided and distributed by floor scrubbing, the air can become sufficiently poisonous to cause mild chronic symptoms