

radicals with that of TAN, which was synthesised according to the method described by Rozantsev¹³. As seen from Table 1 the linewidth, the *g*-factor and the nitrogen splitting of the photo-produced radical and those of TAN are identical within the error limits.

The photo-induced yield of radicals was about 10 times higher in D₂O than in H₂O. This confirms our assumption that the radicals are produced by a singlet oxygen pathway as the lifetime of ¹O₂ is 10 times longer in D₂O than in H₂O (ref. 14). Furthermore, this shows that 0.02 M 2,2,6,6-tetramethyl-4-piperidone does not reduce the lifetime of ¹O₂ even in D₂O. Thus the method is convenient for studying the effect of singlet oxygen quenchers.

When using this method to monitor singlet oxygen yields in different aqueous solutions pH as well as the temperature of the solutions should be carefully controlled. The temperature dependence of the yields follows the Arrhenius equation between 5 and 40 °C. An activation energy of 12.5 kcal mol⁻¹ may be estimated for the reaction of singlet oxygen with 2,2,6,6-tetramethyl-4-piperidone (0.3 M at pH = 7.4). Furthermore, one should be aware that any strong oxidising agent may produce the radical: for example when TAN is synthesised from 2,2,6,6-tetramethyl-4-piperidone, H₂O₂ is used as the oxidising agent¹³. Hence, in systems where many oxidants are likely to be produced one should compare the yields with H₂O and D₂O as solvents to verify that radical production takes place through singlet oxygen.

The sensitivity of the method was estimated as follows: Using a known concentration of TAN as a standard and determining the light intensity ($\lambda = 405$ nm) by means of a calibrated YSI Kettering Model 65A radiometer we were able to estimate the quantum yield of photo-produced radicals to 5×10^{-4} in a solution of 0.3 M 2,2,6,6-tetramethyl-4-piperidone and 10^{-4} M haematoporphyrin (pH = 7.4). Before irradiation about 4×10^{-7} M radicals were present in the samples as an impurity. To produce an additional 4×10^{-7} M radicals in an ESR sample of 0.2 ml a light dose of 50 mJ must be absorbed in the sample. The sensitivity of our ESR spectrometer allows detection of 10^{-8} M TAN so one could, in principle, detect an absorbed dose of 1.3 mJ provided one could get rid of the background signal by purifying the amine.

These doses may be compared with biologically relevant doses. The D₃₇ dose for inactivation of NHK 3025 cells, which originate from a human carcinoma *in situ*, is about 1 J cm⁻². This refers to cells growing in tissue culture flasks being irradiated ($\lambda = 405$ nm) in the presence of 4×10^{-4} M haematoporphyrin in E2a medium (J.M., unpublished results). Light doses proposed for phototherapy of cancer are of the order of 120 J cm⁻² (ref. 15). Thus in such conditions the method of detecting singlet oxygen by means of its reaction with 2,2,6,6-tetramethyl-4-piperidone has a sensitivity which is more than adequate.

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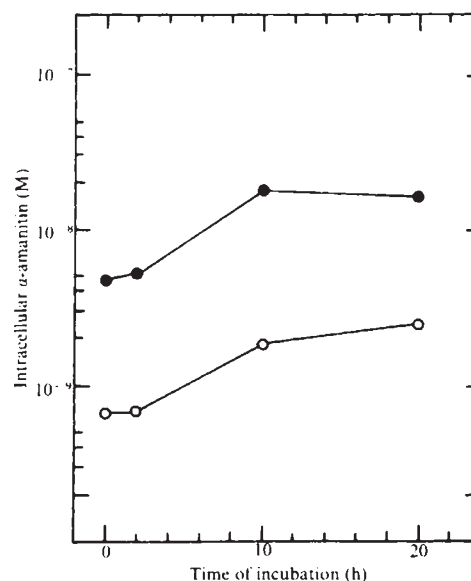
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Corrigenda

In the letter 'Viroid replication is inhibited by α -amanitin' by E. W. Ferguson and G. E. Sanger, *Nature* **278**, 185, the values for α -amanitin concentration on Fig. 2 are incorrect. The figure is reproduced correctly below.



In the article 'Bursal dissections and gill pouch hormones' by J. W. Shields, *Nature* **259**, 373-376 (1976), the following items on page 374 (column 2) should be amended:

(1) In line 1, for surgical bursectomy read testosterone bursectomy.

(2) In section (4) it was stated that birds also differ from mammals because avian neonates lack immunoglobulins from maternal milk. This is true in precocial hatchlings (such as chicks), but is not true for altricial nestlings (such as pigeons) which feed until nidifugation on regurgitated parental crop sac milk¹. The 'pigeon's milk' is produced in parental pharyngeal mucous glands containing tonsillar tissue; it looks like mammalian colostrum; and apparently compensates for the atrophic cloacal bursae of *Fabricius* in altricial nestlings².

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Erratum

In the letter 'Highly efficient quantum conversion at chlorophyll *a*-lecithin mixed monolayer coated electrodes' by Miyasaka *et al.*, *Nature* **277**, 638-640, Table 1 (shown below) was omitted.

Table 1 Photocurrent quantum efficiencies at chlorophyll *a*-lecithin mixed monolayers*

Molar ratio Chl <i>a</i> /DPL	Mean Chl <i>a</i> -Chl <i>a</i> intermolecular distance (Å)	Absorbance per layer† in red band	Peak positions of photocurrents (nm)		Photocurrent efficiency in red band‡ (%)
			Red	Blue	
1/0	10	0.0082	675	415	6
2/1	12	0.0060	675	415	8
1/1	12	0.0058	675	412	10
1/2	13	0.0047	675	415	9
1/4	17	0.0031	675	415	8
1/9	24	0.0018	673	418	10
1/19	36	0.0008	673	410-420	14 ± 2
1/49	56	0.0003	666	420	25 ± 5
1/99	83	0.0002	670	425	25 ± 5

* Conditions of measurements: electrolyte composition, 0.05M H₂O, 0.1M Na₂SO₄ and phosphate buffer (pH 6.9); electrode potential, 0.1V vs SCE; surface pressure for monolayer deposition, 20 dyn cm⁻¹.

† Measured at OTE-air interface.

‡ In the absence of H₂O, the quantum efficiency measured at 0.6V vs SCE in neutral electrolyte solution was about 1.5% for a mixed monolayer of Chl *a*/DPL (1/1).