Die regelmässige Veränderung der relativen Ausbeuten an α- und β-Verbindung ist hier noch ausgeprägter als in der Tabelle der vorigen Mitteilung und findet, wie schon dort hervorgehoben wurde, grösstenteils ihre Erklärung in den verschiedenen elektrischen Ladungen der Chloratome in HOCl und HCl. Die Reaktionen V bieten hier als Extremfall ein Gegenstück zu den Reaktionen I. Besonders für den Reaktionstypus V können aber wahrscheinlich auch sterische Einflüsse eine nicht zu unterschätzende Rolle spielen.

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Influence of Nitrate Concentration upon Chlorate Toxicity in Microorganisms

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Following the discovery that sodium chlorate is effective as a weed eradicant under certain conditions, soil microbiologists became interested in the action of this substance on microorganisms. One of the most important contributions in this field is that of Stapp and Bucksteeg [1], who found that fungi and bacteria are as a rule very resistant to chlorate. A few exceptions have been demonstrated by earlier investigators, for instance the nitrifying bacteria, which are sensitive to chlorate.

It has also been shown that nitrate reduces the toxic effect of chlorate on higher plants, and Hurd-Karrer [2] suggested that chlorate specifically interferes with the reduction of nitrate in plants. A theory for the mechanism of chlorate action was developed and experimentally supported by Åberg [3].

In the experiments of Stapp and Bucksteeg cited above no special attention was given to the nitrogen source, since the importance of this was not clearly established at that time. On the basis of the hypothesis of chlorate action one should not, however, expect chlorate to be toxic to ordinary microorganisms, unless the nitrogen assimilated is offered in the form of nitrate. Further, the effect of chlorate should be more pronounced at low nitrate concentrations, because higher concentrations would prevent the nitrate-reducing enzyme, by competition, from combining with the chlorate.

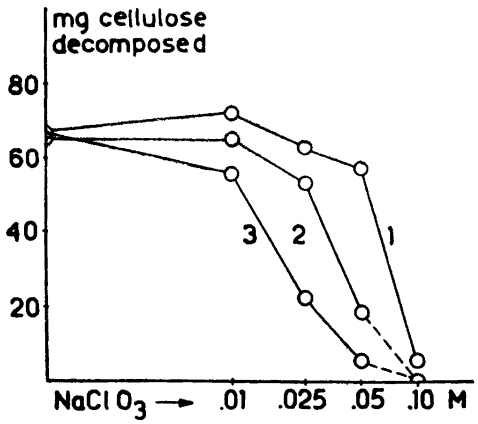

Fig. 1. Decomposition of cellulose by Cytophaga in the presence of varying amounts of sodium nitrate and sodium chlorate. 7 days. Each point represents the mean of 4 replicate samples. 1) 0.02 M $NaNO_3$, 2) 0.01 M $NaNO_3$, 3) 0.005 M $NaNO_3$.

However, in the recent work of Goksöyr [4] *Aspergillus oryzae* was shown to be strongly inhibited by chlorate in the presence of KNO_3, irrespective of the nitrate concentration. The molar ratio nitrate/chlorate was, in one case, as large as 100:1. In the presence of ammonium salt no inhibition occurred.

The present author studied cellulose-decomposing bacteria (also included in the work of Stapp and Bucksteeg [1]). Quantitative experiments were carried out with a *Cytophaga* strain, "W" [5, p. 226]. The decom-

position of cotton cellulose was followed according to methods described earlier [6, p. 17–19]. Samples from flasks were withdrawn after 7, 14, and 21 days for determination of residual cellulose. If ammonium phosphate was used as a nitrogen source, the addition of up to 1 % (0.1 *M*) Na ClO_3 had very little effect on the cellulose decomposition. The results obtained with a nitrate medium were different. The values from this experiment are given in Fig. 1. The diagram has been drawn in the same fashion as Goksöyr's [4] Fig. 1 to permit direct comparison.

It is evident that chlorate affects the decomposition of cellulose in *Cytophaga* cultures containing nitrate and that the inhibition by chlorate is dependent on the amount of nitrate present. At a ratio chlorate/nitrate of 1:1 or even 2:1, there is no appreciable inhibition of the cellulose decomposition, but at higher ratios there is a significant effect. This is at variance with the results obtained by Goksöyr [4] with *Aspergillus*.

Admittedly, *Aspergillus* and *Cytophaga* are widely different organisms, and although the evidence brought forward favours the hypothesis that chlorate is able to combine with the nitrate-reducing enzyme, the affinity of this to chlorate may perhaps vary from one organism to another. Further studies on different microorganisms are therefore needed.

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The Crystal Structure of the Methanethiosulphonates of Divalent Sulphur, Selenium and Tellurium

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The synthesis and the unit cells and space group of these compounds were described by one of us recently [1]. The crystals are isomorphous, with a four-molecule unit cell based on the space group $C_{2h}^5 - P2_1/n$. The dimensions are:

	a, Å	*b*, Å	*c*, Å	β
$S(S_2O_2CH_3)_2$	11.33	5.21	16.14	91°
$Se(S_2O_2CH_3)_2$	11.38	5.23	16.23	91°
$Te(S_2O_2CH_3)_2$	11.43	5.29	16.32	91°

Weissenberg photographs were taken with CuK radiation on multiple films, and the intensities estimated visually.

A Patterson synthesis based on the *h0l* data for the tellurium compound indicated four possible tellurium positions. A Fourier map for one of the positions, using signs of the reflections calculated from the tellurium contributions alone, gave a clear resolution of the sulphur atoms. Inclusion of the calculated structure factors from these atoms changed the sign of 13 % of the reflections, and a second two-dimensional Fourier analysis was made, with the resulting tellurium and sulphur parameters:

	S_I	S_{II}	Te	S_{IV}	S_V
x	0.133	0.123	0.234	0.422	0.436
z	0.117	−0.017	−0.068	−0.054	−0.163

A Fourier analysis based on the *h0l* data for the sulphur compound was subsequently carried out, using signs of the reflections obtained from the tellurium compound revised by subtracting two thirds of the calculated tellurium structure factors. The five sulphur atoms were clearly resolved, and after three successive