to Dr. Heywood, of May and Baker, Ltd., for preparing and supplying a specimen of β-hydroxy-γ-(4-chlorophenoxy)butyric acid.

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Breakdown of Cellulose Dextrin and Gelatin in the Presence of Attapulgite

The attenuation in the breakdown of protein materials and soluble cellulose dextrin by micro-organisms with montmorillonite has been reported by Pinck *et al.*[1], Ensminger and Gieseking[2] and Lynch and Cotnoir[3]. This attenuation in the case of cellulose dextrin was attributed partially to the inactivation of the enzyme cellulase[3].

Another clay mineral, attapulgite (*p*H 8·5), intermediate in crystal structure between montmorillonite and kaolinite, has been studied using gelatin and cellulose dextrin (prepared from cellulose by degrading it with 72 per cent sulphuric acid)[4] as the substrates. Gelatin alone (100 mgm.) and gelatin plus 1 gm. of attapulgite were shaken with a phosphate buffer, *p*H 6·6, and inoculated with a soil suspension. The gelatin plus attapulgite medium evolved 4·15 m.equiv. of carbon dioxide while the gelatin alone evolved 4·03 m.equiv. of carbon dioxide. The attapulgite plus 100 mgm. of cellulose dextrin evolved 1·73 m.equiv. of carbon dioxide, while the cellulose dextrin alone evolved 2·60 m.equiv. of carbon dioxide (Table 1) after 8 days. These values have been corrected for evolution of carbon dioxide from the yeast extract control which in the presence and absence of clay gave a value of 1·82 millequivalents of carbon dioxide.

The activity of the enzyme, cellulase, was tested in an Ostwald viscometer at 25° C. using methyl cellulose (4,000 centipoise) as the substrate. 3·6 mgm. of the enzyme in 50 ml. of 0·05 *M* acetate buffer, *p*H 4·15, were shaken in the presence and absence of 100 mgm. of the clay minerals, attapulgite and montmorillonite, for 24 hr. The samples were centrifuged and 5 ml. of the supernatants were incubated for 1 hr. at 25° C. with 5 ml. of 0·5 per cent methyl cellulose. The time of efflux was then measured. It can be seen from Table 2 that, unlike the montmorillonite, the cellulase was not inactivated by the attapulgite.

Table 1. Amounts of Carbon Dioxide evolved by Soil Micro-organisms in the Presence and Absence of Attapulgite

Substrate	Amount added	Carbon dioxide (m.equiv.) corrected* for yeast extract		Protection (per cent)
		No clay	Clay	
Cellulose dextrin	(1) 100	2·66	1·80	
		2·61	1·72	
	(2) 100	2·57	1·63	
		2·51	1·79	
	(Average)	2·60	1·73	33·2
	S.D.	0·072	0·076	
Gelatin	100	4·21	4·16	
		3·85	4·14	
	(Average)	4·03	4·15	0·0

* The carbon dioxide evolved by the yeast extract control has been subtracted.

Table 2. Degradation of Methyl Cellulose (4,000 Centipoise) by Cellulase in the Presence and Absence of Clay Minerals as indicated by Efflux Time from Ostwald Viscometer

	Average time of efflux
Attapulgite	
Buffer + meth. cell.	4 min. 23 sec.
Buffer + meth. cell. + cellulase	1 min. 56 sec.
Buffer + meth. cell. + cellulase + clay	1 min. 57 sec.
Montmorillonite	
Buffer + meth. cell.	5 min. 47 sec.
Buffer + meth. cell. + cellulase	1 min. 46 sec.
Buffer + meth. cell. + cellulase + clay	2 min. 37 sec.

It is suggested, by analogy with results obtained with montmorillonite[3], that the cellulose dextrin, which exists in units of 20–30 anhydro-glucose molecules, can enter into the holes or spaces in the attapulgite lattice and is thereby protected from attack by the soil micro-organisms. The gelatin, because of its greater molecular size, is unable to do this.

Because of the prevalence of attapulgite in many soils this observation of the attenuation of breakdown of cellulose dextrin is perhaps significant in terms of soil organic matter relationships. To our knowledge, this is the first use of this soil clay mineral in this type of study.

The attapulgite, the cellulase and the methyl cellulose used in this work were commercial preparations from Ward's Natural Science Estab., Inc., the Bios and General Chemical Companies, and from Dow Chemical Co., respectively.

This communication is published with the approval of the Director of the Delaware Agricultural Experiment Station; funds for the investigation were provided by Andelot, Inc., through the University of Delaware Research Foundation.

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Electrophoresis of Glucose Epimers

The movement of sugars in an electric field has already been used in certain analytical and preparative methods. This movement is based on the principle that borate ions form complexes with hydroxyl groups in sugars, so that these will move towards the anode in a borate buffer.

A method by which the epimerization of glucose, especially in biological material, could be estimated, would be of great interest. Therefore, electrophoresis was applied to solutions of α- and β-glucopyranose. The method used in our investigations was that of Consden and Stanier[1]. The mobilities for different sugars found by them are well reproducible.