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ENANTIOSELECTIVE HYDROLYSIS BY BAKER'S YEAST

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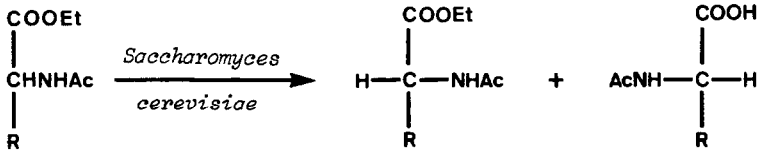
Abstract: Optically active N-acetylamino acid esters were obtained by enantioselective hydrolysis of their racemates using fermenting baker's yeast.

The use of baker's yeast for the enantioselective reduction of ketones is well documented by numerous examples[2]. On the contrary much less is known about the hydrolytic properties of this microorganism[3]. A few reports describe hydrolytic conversions proceeding either in an enantioselective[3a] or achiral manner[3b]. Most of the latter cases seem to have occurred as undesired side reactions.

In view of this limited information available investigations on the hydrolytic properties of yeast have been started in our laboratory. Preliminary results of these studies are given below.

Scheme: Enantioselective hydrolysis of racemic N-acetylamino acid esters **1**. The unreacted D-enantiomer was isolated.



DL-**1** D-**1** L-**2**

1	R	Me	Et	i-Bu	$PhCH_2$	$(CH_2)_2CO_2Et$	CH_2OAc	$(CH_2)_4NHAc$
	e.e. (%)	100	>96	92	97	89	43	nonsubstrate
	recovery (%)	47	48	38	38	46	37	94

Esters of racemic N-acetylamino acids 1 were subjected to the action of fermenting baker's yeast (*Saccharomyces cerevisiae Hansen*[4]) for 48 hours[5]. After extraction of the culture medium with dichloromethane followed by Kugelrohr distillation and column chromatography on silica gel the unreacted esters 1 were found to be the "unnatural" D-enantiomers. In case of the lipophilic amino acids the optical purities were 92-100 % as determined by ^{1}H-NMR shift experiments using Eu(hfc)$_3$ and comparison of the optical rotation values. With the more hydrophilic esters of N-acetyl glutamic acid and bis-acetyl serine the e.e. dropped significantly whereas the ester of bis-acetyl lysine turned out to be a nonsubstrate. The recovery rates of material were acceptable considering 50 % being the theoretical amount. The corresponding L-N-acetylamino acids 2 remained in the aqueous phase and were not isolated.

Referring to the numerous examples of enantioselective hydrolysis by microorganisms other than yeast[6] these findings indicate that the hydrolytic properties of yeast have not yet been noticed sufficiently. A detailed study on this subject is currently in progress.

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References and Notes:

1. Part of the Ph.D. thesis, in progress.

2. For leading references and reviews see: K.Kieslich, Microbial Transformations of Nonsteroid Cyclic Compounds, p.633, Thieme, Stuttgart 1976, D.Seebach, M.A.Sutter, R.H.Weber and M.F.Zueger, Org.Synth. **63**, 1 (1984), C.J.Sih and C.-S.Chen, Angew.Chem.Int.Ed.Engl. **23**, 570 (1984), H.Simon, J.Bader, H.Guenther, S.Neumann and J.Thanos, Angew.Chem.Int.Ed.Engl. **24**, 539 (1985).

3. a) W.J.Marsheck and M.Miyano, Biochim.Biophys.Acta, **316**, 363 (1973), S.Miura, S.Kurozumi, T.Toru, T.Tanaka, M.Kobayashi, S.Matsubara and S.Ishimoto, Tetrahedron **32**, 1893 (1976), T.Tanaka, S.Kurozumi, T.Toru, S.Miura, M.Kobayashi and S.Ishimoto, Tetrahedron **32**, 1713 (1976), K.Laumen and M.Schneider, Tetrahedron Lett. 5875, **1984**.
b) L.Manoli, Ber.Dtsch.Chem.Ges. **71**, 2696 (1938), W.P.Schneider and H.C.Murray, J.Org.Chem. **38**, 397 (1973), C.J.Sih, R.G.Salomon, P.Price, R.Sood and G.Peruzotti, J.Am.Chem.Soc. **97**, 857 (1975), C.-Q.Han, D. DiTullio, Y.-F.Wang and C.J.Sih, J.Org.Chem. **51**, 1253 (1986).

4. Obtained from Reininghaus Co. Ltd., Graz, Austria.

5. Conditions: 35°, saccharose as nutritive, no use of buffers.

6. For representative papers see: K.Mori and H.Akao, Tetrahedron **36**, 91 (1980), M.Kasai, K.Kawai, M.Imuta and M.Ziffer, J.Org.Chem. **49**, 675 (1984), H.Ohta and H.Tetsukawa, Agric.Biol.Chem. **44**, 863 (1980), T.Oritani, M.Ichimura, Y.Hanyu and K.Yamashita, Agric.Biol.Chem. **47**, 2613 (1983).

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