Alcohol:NAD Oxidoreductase from Peas *(Pisum sativum)*

CAJ E. ERIKSSON

Swedish Institute for Food Preservation Research (SIK), Göteborg, Sweden

Alcohol:NAD oxidoreductase (alcohol dehydrogenase, ADH) is widely distributed among animals, plants, and micro-organisms. The yeast and liver enzymes are the ones investigated most; their substrate specificity is not pronounced.[1] Numerous papers have been published on the enzyme in peas, but none of them contain data on the specificity regarding alcohols.

It was therefore thought worthwhile to investigate the substrate specificity of ADH found in pea seeds with special reference to alcohols which are believed to contribute to the flavor of green peas. It is the purpose of this communication to report that the pea enzyme was found to catalyze the oxidation of several types of alcohols but at different rates. The coenzyme proved to be NAD^+, whereas $NADP^+$ was quite ineffective; this confirmed earlier results.[2] The reaction was followed by the increase in absorbancy at 340 nm after addition of the alcohol to a mixture of enzyme, coenzyme, and buffer. Impure alcohols were purified by preparative gas chromatography before use. Ethanol was used in two concentrations; the other alcohols, in one or both of these concentrations. The initial reaction rates of these alcohols were compared with the corresponding rate of ethanol. The aldehydes produced in the reaction were identified by gas chromatography followed by mass spectrometry of the separated compounds. The most interesting observation in this investigation was the high relative rate of the ADH catalyzed reaction of *trans*-2-hexen-1-ol. The reaction rate of this alcohol was about three times that of ethanol (Table 1). It is clear from the table that the reaction rate of an unsaturated alcohol was invariably higher than that of the saturated analogue. For some unknown reason this effect was smaller for *trans*-2-buten-1-ol. The reaction rate was very low with secondary, cyclic, and aromatic alcohols. In several cases the equilibrium constants of the reactions were determined. The yeast ADH was also found to catalyze the oxidation of the unsaturated alcohols used in this investigation.

Table 1. Alcohol:NAD oxidoreductase of pea seeds. Relative reaction rates obtained with some saturated and unsaturated alcohols for $(NAD^+) = 5 \times 10^{-4}$ M and pH = 8.2. Concentration: (a) 10^{-2} M; (b) 10^{-3} M.

Alcohol	Relative reaction rate
(a)	
Ethanol	1.00
Propanol	0.18
2-Propen-1-ol (allyl alcohol)	1.41
Butanol	0.27
trans-2-Buten-1-ol	0.55
(b)	
Ethanol	1.00
Butanol	0.22
trans-2-Buten-1-ol	0.49
Hexanol	0.12
trans-2-Hexen-1-ol	2.93

The investigation will be reported in detail in a future paper.

1. Sund, H. and Theorell, H. In Boyer-Lardy-Myrbäck, *The Enzymes*, Academic, New York 1963, Vol. 7, p. 25.
2. Adler, E. and Sreenivasaya, M. *Z. physiol. Chem.* **249** (1937) 24.

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