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Localization of Catalase A in Vacuoles of *Saccharomyces cerevisiae*: Evidence for the Vacuolar Nature of Isolated "Yeast Peroxisomes"

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Summary: The subcellular distribution of catalase A in the yeast *Saccharomyces cerevisiae* has been investigated. The enzyme was found to be bound to large particles, whereas most of the activity of catalase T was located in a 38000 × *g* supernatant. Under various isolation conditions catalase A always showed a distribution among subcellular fractions virtually identical to that of two markers for vacuoles, proteinase B and α-mannosidase. More than 80 percent of the catalase A activity of a crude vacuole fraction has been detected in purified vacuoles. Malate synthase, isocitrate lyase and glyoxylate reductase (NADP®), three peroxisomal markers, showed a subcellular distribution significantly different from that of catalase A. It is concluded from these results that catalase A is specifically associated with the vacuoles of yeast. Like vacuoles, "peroxisomal" fractions isolated from yeast spheroplasts as described by Avers[1] contain only one catalase protein, catalase A. It could be shown by isopycnic and sedimentation velocity separations of crude mitochondrial fractions that catalase A in "peroxisomal" fractions is accompanied by considerable activities of proteinase B and α-mannosidase. From all our results it seems that the catalase-active particles isolated under such conditions are not typical peroxisomes but vesicles formed from vacuoles during the isolation procedure.

Lokalisierung von Katalase A in Vakuolen von Saccharomyces cerevisiae: Die vakuoläre Herkunft isolierter „Hefeperoxisomen"

Zusammenfassung: Es wurde die subzelluläre Verteilung von Katalase A in der Hefe *Saccharomyces cerevisiae* untersucht. Es wurde festgestellt, daß das Enzym an große Partikel gebunden ist, hingegen wurde der größte Teil der Aktivität von Katalase T in einem 38000 × *g*-Überstand nachgewiesen. Unter verschiedenen Isolierungsbedingungen wies Katalase A immer die gleiche Verteilung über subzelluläre Fraktionen auf wie zwei Leitenzyme für Vakuolen, Proteina-

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Enzymes:
Catalase, hydrogen-peroxide:hydrogen peroxide oxidoreductase (EC 1.11.1.6);
Glyoxylate reductase (NADP®), glycollate:NADP® oxidoreductase (EC 1.1.1.79);
Isocitrate lyase, *threo*-D_s-isocitrate glyoxylate-lyase (EC 4.1.3.1);
Malate synthase, L-malate glyoxylate-lyase (CoA-acetylating) (EC 4.1.3.2);
α-Mannosidase, α-D-mannoside mannohydrolase (EC 3.2.1.24);
Succinate dehydrogenase, succinate:(acceptor) oxidoreductase (EC 1.3.99.1);
Yeast proteinase B (EC 3.4.22.9).