in each class, designated λ W6 and λ H8, were cloned into pBluescript SK+ vector, and both strands were sequenced (Sequenase Version 2.0, protocol U.S. Biochemicals, Cleveland, OH). The 3.4 kb fragment of λ H8 represents the full-length cDNA of mouse β-catenin, whereas the 2.8 kb fragment of λ W6 encodes part of mouse plakoglobin, beginning at amino acid 124. The deduced amino acid sequence of mouse β-catenin has a calculated molecular size of 85.5 kD, which agrees with 88 kD, the molecular size of uvomorulin-complexed β-catenin. Protein sequence alignment was done with a Genetics Computer Group program for the VAX. The GenBank accession number for mouse β-catenin is M90364 and for mouse plakoglobin, M90356.


7. A peptide containing the amino acid sequence overlined in Fig. 1, which represents the carboxyl terminus of β-catenin, was coupled by glutaraldehyde to keyhole limpet hemocyanin (Sigma, St. Louis, MO). After three subcutaneous immunizations at 3-week intervals, specific antibodies were isolated on a peptide-μ-aminohexanoyl (EAH)-Sepharose (Pharmacia, Fairfield, NJ). Column (5 mg of peptide coupled to 1 ml of EAH-Sepharose 4B, as described by the manufacturer.

8. Immunoprecipitation and immunoblot experiments were performed as described in (1). Immunocomplexes were collected from lysates of 4 × 10^6 cells with 4 µg of antibodies to uvomorulin and Protein A-Sepharose (Pharmacia). Proteins were separated by 8% SDS-PAGE under reducing conditions. Antibodies to β-catenin (5 µg per milliliter) and to plakoglobin (1 µg per milliliter) were diluted in phosphate-buffered saline in immunobLOTS. Mouse monoclonal antibody to bovine plakoglobin was purchased from Progen (Heidelberg, Federal Republic of Germany).


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Response: The work presented by Butz et al. appears to be in agreement with the principal conclusion of our earlier work (1), which demonstrated that β-catenin is highly homologous to the Drosophila gene product armadillo and to human plakoglobin. At that time, we erred in favoring the interpretation that plakoglobin and β-catenin were the same protein because we did not notice the small difference in their gel mobilities and did not yet have antibodies to β-catenin (or to armadillo) that would have made that difference more obvious. Nonetheless, the greater degree of sequence conservation maintained over evolutionary time between Xenopus β-catenin and Drosophila armadillo, compared with that between Xenopus β-catenin and human plakoglobin (both from vertebrates), led us to discuss the possibility that β-catenin and plakoglobin might be distinct members of a gene family.

Butz et al. present excellent and interesting evidence that β-catenin and plakoglobin are distinct, although closely related, proteins within the same cell. We are in complete agreement concerning this issue; on the basis of recent immunological evidence from experiments with MDCK cells, we have, in a collaborative effort, reached the same conclusion (2).

Our findings in (2) and that of Butz et al. differ on one point. We find that plakoglobin is a component of the E-cadherin–catenin complex. Although it is more weakly associated with the complex than is β-catenin [as determined by the ease with which it is removed from the complex with detergents and other washes (3)], it specifically immunoprecipitates with E-cadherin from MDCK cells (1, 2). As Butz et al. point out, it is conceivable (we think likely) that differences in the composition of the solutions used for cell extraction, immunoprecipitate washing, and so forth may explain why we more readily observe plakoglobin in E-cadherin immunoprecipitates. It remains to be determined whether plakoglobin is the γ-catenin polypeptide present in E-cadherin immunoprecipitates.

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