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AMINO ACID GEOCHRONOLOGY UTILIZING TERRESTRIAL GASTROPODS FROM WESTERN U.S.

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Amino acid analyses of Pleistocene terrestrial gastropods from various localities in western U.S. revealed an increasing proportion of D-alloisoleucine to L-isoleucine (allo/iso ratio) in the total acid hydrolysate with increasing sample age between 10^4 and 10^6 YBP. A suite of Ashmunella rhyssa fossils from SE New Mexico yielded allo/iso ratios of 0.015 (modern), 0.06 (11,330 14C), 0.16 (>40,000 14C), 0.41 (pre-Wisconsin) and 0.84 (Kansan?) with current mean annual temperatures (CMAT) between 10 and 12°C. Succinea from S.E. Arizona (CMAT = 18°C) have allo/iso ratios of 0.14 (10,000 14C) and 0.17 (20,000 14C), whereas Succinea from the Bonneville basin, Utah (CMAT = 10°C) gave ratios of 0.13 (13,000 14C) and 0.27 (Alpine Fm, >35,000 14C), and Succinea allo/iso ratios above and below the Pearlette O ash, Wyoming (CMAT = 5.4°C) were 0.44 and 0.48 respectively. Allo/iso ratios in the free fraction parallel, but are always greater than those in the total fraction. As in other carbonate fossils, amino acid composition, concentrations and racemization rates vary between genera. Separate analyses on different individuals of a single genus generally differ by less than 10%. Because of the uncertainties in the Arrhenius parameters and integrated thermal history of a fossil, the derivation of absolute ages from racemization data remains elusive. However, the isoleucine epimerization data may be used directly to correlate between discrete strata over limited geographical (climatic) regions and to provide relative age data. The association of samples with either datable ash beds or paleomagnetic reversals provides a calibration point at the upper end of the reaction range, and coupled with more detailed pyrolysis experiments may allow absolute age calculations within reasonable confidence limits.

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ENVIRONMENTAL CONTROLS IN THE AMINO ACID RACEMIZATION RATE FROM CONTINENTAL - INTERIOR DEPOSITS. № 05036

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In an attempt to define the relative importance of various environmental parameters on the rate of amino acid racemization, we obtained mollusc and temperature data from nine stratigraphically-controlled Clovis paleoindian cultural horizons (ca. 11,200 yr BP) and eight other dated late-Pleistocene sites of similar age that cover a broad range of temperature and moisture regimes. Present-day site temperatures range from ca 4°C (Wasden site), ID) to 21°C (Searles Lake, CA); moisture ranges from arid and semi-arid (eg. Searles Lake, Ca; Murray Springs site, AZ) to continually wet (Manis site, WA). Racemization studies were concentrated on the pelecypod genera Sphaerium and Pisidium and the gastropod genera Vallonia and Lymnaea. Pyrolysis of modern shells at 160, 120 and 80°C, coupled with D/L ratios from the study sites, define Arrhenius parameters for the four genera. Activation energies are 28.8±0.1 Kcal $mole^{-1}$ except for Sphaerium which is 29.8 Kcal $mole^{-1}$. Applying the Arrhenius parameters to the measured D/L ratios for samples if known age results in temperature predictions within 1°C of the present-day value for all sites irregardless of moisture conditions. We conclude that temperature is the primary rate-controlling variable for racemization and that D/L ratios in continental mollusca are suitable for geothermometric and geochronologic studies.