BIOLOGY

Protein development from egg to embryo

Very early changes during embryo development have been analyzed with arrays of spots. Four hundred to 600 spots, each representing a distinct protein, are visible with a technique that distributes proteins according to their size and electrical charge. A group of Stanford University investigators examined mouse ova and preimplantation embryos and found 36 proteins that are made at some, but not at all, times in early development.

The protein patterns indicate that maternally derived genetic information may be crucial during the earliest development, but by the 4-cell stage the embryonic genes begin to take control. Synthesis of at least 12 proteins, made in unfertilized eggs, is discontinued during the 2-cell stage. On the other hand, a number of other proteins begin being produced in the single-cell and 2-cell embryos. By the time embryos reach the 4-cell stage, changes are less frequent and relatively minor, report John Levinson, Peter Goodfellow, Mary Vadeboncoeur and Hugh McDevitt in the July PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. The researchers detected no differences in protein synthesis among ova and embryos of several inbred mouse strains.

Dissecting rattlesnake damage

Five chemicals that rip apart capillary cells are responsible for part of the damage of western diamondback rattlesnake venom. In the August 8 BIOCHEMISTRY Anthony T. Tu and Jon B. Bjarnason of Colorado State University report isolation of the compounds. Toxins from the venoms of cobras and sea snakes have been studied extensively, the researchers say, but North American rattlesnake venom has been virtually ignored.

Hemorrhaging is a major effect of rattlesnake toxin. The toxins break down proteins essential to cell membrane structure and blood vessels fall apart, Tu explains. The newly isolated compounds are three to four times larger than nerve poisons and all contain zinc. Removing zinc with a chelating agent effectively inhibits the hemorrhagic activity.

Cowlicks fingerprint horses

Two race horses were switched last year at Belmont track on Long Island. The incident highlighted a need of tracks, breed registries, insurance companies and horseowners for a way to identify horses reliably. Two veterinarians of the U.S. Department of Agriculture and Washington State University have evidence that a horse's hair whorl above the eyes can be used as a permanent identification. The whorl is created during embryonic life when skin is stretched around the forehead. Once the hair direction has developed, the pattern seems set for life. R. Keith Farrell and Mike Conaway record hair whorls by taking a negative clay mold of a horse's forehead. A positive cast made from the mold can be inked and printed, like a fingerprint. Such "trichoglyphs" are used in the Far East where tatooing and branding livestock is forbidden, Farrell and Conaway say.

Quick check on milk

Testing the vitamin D level in milk has just entered the modern chemical age. J. Gordon Hanna of the Connecticut Agricultural Experiment Station announces a precise method to check for the small quantity of vitamin D that must be added to milk (one teaspoon in 1,250 gallons). The new liquid chromatographic technique replaces a cumbersome and inaccurate biological test. Previously, rats with rickets were fed milk, and if the disease was not cured the milk was assumed to lack sufficient vitamin D, Hanna says.

GEOPHYSICS

Dilatancy: A stamp of approval

Among the variety of natural events that seem to herald an earthquake, few others have excited geophysicists' attention more than the so-called dilatancy phenomenon: Rock under stress tends to craze and thereby cause any compressional waves traveling through it to do so at a reduced speed. Seismologists during the recent past have tried with ambiguous success to monitor this tell-tale velocity reduction around earthquake-prone areas with hopes of being able to refine efforts to make reliable quake predictions.

An encouraging development toward this hopeful expectation was recently reported by a Columbia University geophysicist who has critically compared and found excellent agreement between extensive laboratory data and the predictions of a dilatancy hypothesis authored by Richard J. O'Connell and Bernard Budiansky of Harvard University. The data were compiled as a doctoral thesis several years ago by Kate Hadley at the Massachusetts Institute of Technology and include measurements made on Westerly granite and San Marcos grabbo, the latter rock being far less permeable to fluids than the former. During her experiments, Hadley alternatively exposed the rocks, which were artificially stressed to mimic the action of seismic waves, to air, water and carbon dioxide gas, under various laboratory conditions.

With some qualification, Christopher H. Scholz reports in the August 4 SCIENCE, the "experimental observations of dilatancy-induced velocity changes are quite consistent with theory." An inconsistency exists, according to Scholz, between the actual number of tiny fissures per unit volume the stressed rock suffers and that which is predicted by the hypothesis. He speculates that the discrepancy could be reconciled if the theoretical model would depict more faithfully than it now does the characteristic anisotropy (manifestable preferential directions within the rock) of the real fractionating process.

A heavenly explanation for giant halos

Halos — not the divine variety, but the geological phenomena — have elicited for many decades some rather fascinating scientific speculation regarding their probable origin. Occurring within mineral rocks and true to their name, pleochroic halos are small, ringlike discolorations that typically surround local concentrations of radioactive uranium or thorium. Of the three definitive groups of halos — dwarves (up to 20 microns in diameter), normal (20 to 45 microns) and giants (up to hundreds of microns) — only the normal ones can readily be described in terms of radiation damage caused by alpha particles emitted via radioactive decay. Their naturally prescribed distance ranges are simply incompatible with the other-size halos.

Previous and inconclusive explanations have related giant halos to the more energetic radiation damage expected from hypothetical superheavy elements (in particular, atomic number 126) or fission products of plutonium minerals. Now a group of six scientists from Oak Ridge National Laboratory have some evidence that giant halos are in fact caused less exotically by a sequence of events that involves only those familiar alpha particles implicated with normal halos. The difference in giants, however, appears from the group's measurements to be that within the initial normal-sized halo the concentration of potassium and perhaps other major elements like oxygen are depleted and partially replaced by calcium. The overall density of that area is thereby decreased, allowing the normal-energy alphas to traverse more easily to a larger distance. Although a similar situation seems to pertain to dwarves, certain details remain unresolved, according to R. V. Gentry and colleagues in their August 3 NATURE article.