tumor cell lines differs from its normal counterpart by a single amino acid change at position 12. The genes coding for the transforming proteins are homologous to genes in several strains of mouse sarcoma viruses. Michael Wigler and co-workers at Cold Spring Harbor Laboratory reported that the transforming $p21^{ras}$ protein includes growth of cells in agar about a thousand-fold more efficiently than the normal protein. They also identified three classes of human *ras* genes, which diverge in both their structure and the sequence of their product.

Arnold Levine and co-workers at SUNY-Stony Brook have utilized cells transformed by wild type and temperature-sensitive mutants of SV40 to examine specific gene products that appear during expression of the transformed phenotype. They identified several "transformation-specific" mRNAs, and have isolated and cloned the genes coding for these RNAs. One of these plasmids, clone 85, produces a growth-stimulated gene product. Since DNA from humans, mice, monkeys, and rats hybridize to this clone, it may be a common growth-stimulated cell protein.—**Tazewell Wilson**

MONOCLONAL ANTIBODIES

MOUSE-FREE, SERUM-FREE CULTURE METHODS REVEALED

PHILADELPHIA—For all its potential specificity, the business of making monoclonal antibodies is still a dirty one. Growing hybridomas in mouse ascites can produce antibody in gram quantities suitable for production purposes, but they are unusable until the product is cleared of mouse-related contaminants. Laboratory scale purification is also required when ordinary serum-containing medium is used for tissue culture. Reports last month at the Second Annual Congress for Hybridoma Research show how either process can be made much cleaner.

Applying well-known techniques used to grow bacteria in suspension, Stephen Fazekas de St. Groth is raising large quantities of hybridomas in what he calls "ascites without the mouse." At the Basel Institute of Immunology in Switzerland he grows hybridomas in a bank of six vessels (each with a stirring mechanism) linked to an anti-immunoglobulin column. Instead of tending mice, technicians "just come through every few days and collect the antibodies" from the column, he says, stressing that his system is ten times less labor intensive than current methods. The total yield from the suspension cultures is equivalent to that from about 300 standard tissue-bottles a day.

Under controlled conditions which are attainable using whole mice, hybridomas are grown at a density just below the level at which cells begin to die off, poisoned by their own products. In suspension, cultures maintain about twice as many cells per unit volume as stationary cultures, says the Swiss immunologist. Cell growth is slower under these circumstances, so the system uses less medium. Since antibody yield depends on cell number and not on growth rate, the yield is still high.

"I have tested by now about 50 hybridomas, and persuaded all of them to grow under these conditions," claims Fazekas de St. Groth. He says it is simple for anyone to grow them with standard laboratory equipment. In feeding the cells, he advises, "look for the worst possible medium in which cells will grow at maximum density." Improving the medium beyond that point reportedly makes the cells grow faster but does not improve antibody yield.

"The fact that our cells can be grown serum free is a distinct advantage (for purification), but for many researchers it might prove to be a disadvantage because the necessary lipids are not commercially available" claims the Swiss scientist. The serum-free medium he uses is made by vesicularizing and then dispersing lipids, a complex process which is difficult to reproduce.

The key to creating serum-free media is to mimic the serum lipids needed by cells to preserve their membranes. Adding low-density lipoprotein (LDL) to an enriched medium, T. Kawamoto and co-workers at the University of California at San Diego have developed a medium (KSLM) which is suitable for growing a commonly used hybridoma fusion partner, the NS1 mouse myeloma cell line.

Using KSLM without LDL allowed the San Diego team to select for a subline, NS1-503, whose fusion rates and antibody yield are considerably higher than its NS1 parent line. Hybridomas made from NS1 and spleen cells produce their own cholesterol, which also allows them to grow in the serum-free medium without LDL.

At present KSLM is known to support only hybridomas derived from NS1 cells; however, Kawamoto says any parent cell line capable of growing in KSLM will probably produce hybridomas that can grow in it. He claims to be willing to provide NS1-503 to other scientists upon request.—**Lois Wingerson**

NEW COMPANIES

ALFA LAVAL AND CARDO FORM JOINT VENTURE

STOCKHOLM—The Cardo Group and Alfa Laval, both based in Sweden, have joined forces in a major union of microbiological equipment and process engineering. Each company will hold a 50 percent interest in a new corporation called AC Biotechnics AB (ACB). Per Kylander is leaving Holmen Co., one of the world's leaders in wood chemical production, to head the new venture.

Chemap AG, previously held by the Cardo Group, is now totally controlled by ACB as a result of the agreement. The Chemap Group, which maintains its base of operations in Switzerland with branches in the Federal Republic of Germany, France, Austria, South Africa, and the U.S., specializes in fermentation and titration equipment. According to René Löser, Vice President of Chemapec, Inc. (the U.S. branch of the Chemap Group), "The activity of ACB will be to help clients build production-sized plants—our expertise is in scale-up" and industrial fermentation.

Utilizing Biostil, a commercial process developed by Alfa Laval for high solids fermentation, and Anamet, a process developed by Cardo for the purification of waste waters, the new firm hopes to hold a strong international position in biotechnology for energy production. While many biotechnological companies are still trying to develop processes or to perfect scale-up, ACB will become one of the first to market fully commercial processes. Alfa Laval contributes to the venture its extensive experience in the areas of advanced separation technology, thermal technology, fluid handling, and international marketing.