

- III. **traditional organic processes, such as specificity, expense, and safety (enzymes are biodegradable).**

**INTRO ENVIRONMENT.** For decades, municipalities have used biological methods to treat their sewage and industry has used secondary aerobic treatment to remove harmful materials from their liquid wastes. Today, biotechnology expands the range of treatment choices. Teams of microbiologists, chemical engineers and environmental engineers are working to eliminate pollutants from waste waters, aquifers, soils, industrial effluents and air. These scientists are gaining a fundamental understanding of the mechanisms of aliphatic and aromatic hydrocarbon degradation by living systems. New metabolic pathways are being designed via genetic engineering. Engineers are developing small scale bioreactors to eliminate the pollutant at the point of production (within the factory). These bioreactors are not only more efficient and less expensive, but they also allow for the use of engineered microorganisms in a controlled environment. This technology is termed bioremediation.

The following section reviews the biotechnology research activities in this region. For further information about research centers and technology transfer opportunities, refer to Appendices A - D.

**MEDICAL RESEARCH.** The explosion in medical biotechnology research has revealed that virtually every disease has a genetic basis. That discovery, added to new information provided by the mapping of the human genome, is leading medical science to the threshold of a new era, the era of genetic medicine. Nearly all medical research on diseases utilizes the tools of biotechnology. Scientists and clinicians at the medical schools, research institutes and clinical hospitals in the North Central U.S. (see Table 1) are making major contributions to the field of genetic medicine.

**Colorado.** The University of Colorado Health Sciences Center, located in Denver, has five separate schools devoted to Medicine, Nursing, Dentistry, Pharmacy and graduate education. Together they serve more than 2,000 students in their basic sciences and clinical programs in two teaching hospitals, an National Cancer Institute-designated Cancer Center, numerous teaching and research facilities, and affiliate institutions. The affiliates include the Barbara Davis Center for Childhood Diabetes, the Eleanor Roosevelt Institute for Cancer Research, the National Jewish Center for Immunology and Respiratory Medicine, the University Hospital, and the Children's Hospital. Research conducted at the CU Health Sciences Center campus has given rise to many innovations in areas such as biological growth factors, chromosome analysis, cell cloning, drug delivery systems, and vaccines for infectious diseases. The CU Health Sciences faculty have a long history of federally funded and privately sponsored clinical research.

The Molecular, Cellular and Developmental Biology Department at the University of Colorado, Boulder is a top-ranking molecular biology research and training site in the world. With 300 faculty and staff, and Nobel Prize Laureate, Tom Cech, (awarded for Chemistry, 1989) - ribozyme research, the Department produces innovative breakthrough technology. UC Boulder also is home to the Colorado RNA Center