

## UTAH TECHNOLOGY TRANSFER PERFORMANCE RANKS WITH NATION'S BEST

The fourth year of operation of the Technology Transfer Office showed impressive gains over last year. The number of consummated option or license agreements rose from 22 to 26 and total royalty revenue rose from \$570,600 to \$622,800 (a 9.1% increase).

This overall performance compares very favorably with most major universities in the nation. If technology transfer effectiveness is compared to the research dollars available for generating technology, then the University of Utah is at or near the top in three key criteria. And if performance in these three areas is averaged, the University ranks third in overall effectiveness in the US, behind such powerhouses as MIT and Stanford. The performance by the top 11 US universities (in terms of overall licensing revenue) is shown below.

### NUMBER OF DISCLOSURES

(per million dollars research budget)

1. UTAH	1.13
2. MIT	0.98
3. RUTGERS	0.70
3. STANFORD	0.70
5. HARVARD	0.42
6. WISCONSIN	0.34
7. NC STATE	0.33
8. WASHINGTON	0.28
9. CALIFORNIA	0.27
10. OHIO STATE	0.24
11. COLUMBIA	0.18

The rate of invention disclosures is the most important success criterion for a technology transfer operation. University of Utah faculty can be very proud of their performance in this regard—best in the nation by a respectable margin.

### NUMBER OF PATENTS ISSUED

(per million dollars research budget)

1. MIT	.36
2. UTAH	.19
3. STANFORD	.16
4. WISCONSIN	.11
5. OHIO STATE	.10
5. HARVARD	.10
7. NC STATE	.08
8. CALIFORNIA	.07
9. WASHINGTON	.02
10. RUTGERS	N/A
11. COLUMBIA	N/A

The number of patents issued is a function of both research quality and funds available for patents. Utah's second-place standing in patents issued per research dollars spent—a standing made possible by heavy investment in patent applications—is evidence of the very high caliber of inventions disclosed by Utah faculty.

### ROYALTY INCOME

(as percent of research dollar budget)

1. STANFORD	3.51%
2. MIT	2.11%
3. RUTGERS	1.37%
4. OHIO STATE	1.35%
5. COLUMBIA	0.87%
6. UTAH	0.55%
6. CALIFORNIA	0.55%
8. HARVARD	0.54%
9. NC STATE	0.36%
10. WASHINGTON	0.27%
11. WISCONSIN	N/A

Utah is proportionally weaker in terms of raw income generated per research dollar spent, though still well within the top ten. However, royalty returns take time to mature since it normally takes several years for new technologies to reach the marketplace. A rank of sixth in the nation is still a good performance for a program as young as Utah's, where most licensed inventions have yet to reach commercialization.

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## INNOVATIONS



Technology Transfer Office  
University of Utah

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**AVERAGE RANKING**

(on per-research-dollar basis)

1.	MIT	1.67
2.	STANFORD	2.33
3.	<b>UTAH</b>	<b>3.00</b>
4.	RUTGERS	5.33
5.	HARVARD	6.33
5.	OHIO STATE	6.33
7.	WISCONSIN	7.00
8.	NC STATE	7.67
9.	COLUMBIA	8.00
9.	CALIFORNIA	8.00
11.	WASHINGTON	9.00

There are many other variables affecting technology transfer; however, when overall performance in the above three key indicators is averaged, the University of Utah comes out third in the nation. For a relatively small university with limited local industrial infrastructure and without the budgets and long-standing reputations of more illustrious research universities, this can be regarded as a very respectable showing indeed.

*Royalty Income, Disclosures and Research Budgets taken from Association of University Technology Managers survey (FY88 data); Patents taken from report issued by Kathleen Terry and John Butler at the University of Minnesota; percentages and rankings computed from this data.*

**MARK YOUR CALENDARS FOR OCTOBER 18!!  
PATENT BASICS FOR UNIVERSITY RESEARCHERS**

The Technology Transfer Office will present a two-hour seminar on "Patent Basics for University Researchers", from 3 to 5 p.m., October 18 at the University Park Hotel. An *hors d'oeuvres* and beverage reception will follow the presentation.

The seminar is highly relevant to anyone involved in research, from senior research faculty to post-docs and graduate students. Patent issues can profoundly affect research, determin-

ing whether a new technology is accepted or whether additional research funding can be obtained. It also greatly affects whether and how much personal income an inventor receives.

The seminar will address such questions as: What is an invention? Who are the inventors? What is patentable? What happens to patentability when I give a poster presentation or send a manuscript in for peer review? Why does industrial research funding depend so greatly on patentability? The seminar will make patent law basics easy to understand and relevant to University researchers; reference materials will be available.

The seminar will also deal with how technology is commercialized, how inventors share in the benefits of that commercialization, and what role the Technology Transfer Office plays.

The seminar and reception are free, but advance registration is required. If you are interested in attending, call the Technology Transfer Office at 581-7792.

**DEPARTMENTAL PAYMENTS BELOW LAST YEAR'S RECORD**

Unlike payments to inventors, departmental payments are not paid according to a specific percentage; the amount is determined each year by the University of Utah Research Foundation (UURF) Board of Directors, up to a

maximum of 25% of Net Income. The Board's determination is based on an assessment of overall profitability of the Technology Transfer operation. Owing to unanticipated costs for fusion-related legal expenses, there was \$61,000 less Net Income than otherwise would have been available for departmental shares. Still, the UURF authorized the payment of \$89,224 to University departments, with another \$15,000 possibly the end of October. Such payments help to "re-prime" the technology pump through re-investment in additional research activities.



Elements and Their Jobs

Barium (Ba):  
Mortician

Cesium (Cs):  
Policeman

Helium (He):  
Doctor

Sodium (Na):  
Seamstress

Rhodium (Rh):  
Aging Cowboy

Cadmium (Cd):  
Loves them and leaves them

## TECHNOLOGY TRANSFER CASE HISTORY

### LEADER IN CONTROLLED-RELEASE DRUG DELIVERY

**TheraTech is active  
in most aspects of  
controlled drug  
delivery research.**

**T**heraTech, Inc. was formed in 1985 by Drs. William Higuchi, Dinesh Patel and Sung Wan Kim to fill the need for sophisticated, scientifically designed drug delivery systems that satisfy biological requirements and therapeutic rationales. Over the past five years, TheraTech has assembled some of the finest technical experts in the fields of transdermal and gastrointestinal drug delivery research. Two major multi-national companies, Pfizer and Kali-Duphar (a wholly-owned subsidiary of Solvay & Cie) hold equity positions in TheraTech. Associations with other major U.S., Japanese, European and Korean pharmaceutical companies have also been established through research & development agreements. In addition, a close relationship between TheraTech and the Department of Pharmaceutics/Center for Controlled Chemical Delivery at the University of Utah has evolved through sponsored research and graduate student training.

In the past, limited drug administration alternatives have prevented or restricted the commercial development and success of a number of therapeutic agents. Conventional drug administration (injection with a needle or swallowing a pill) results in a high immediate blood level, which then tapers off over time. Physicians must balance the risk of toxicity from the initial high level with the risk of too little of the drug later on to have a therapeutic effect.

An ideal solution in many cases would be the continuous delivery of a constant drug quantity, thus avoiding the peaks and valleys of traditional administration techniques (see figure). Such approaches, termed controlled-release delivery systems, achieve predictable and reproducible

release rates over an extended duration, and can achieve optimum therapeutic effects with minimal side effects.

Controlled-release technology has developed rapidly over the last decade. TheraTech is active in most aspects of controlled drug delivery research; however, current efforts are focused on the development of two types of controlled release mechanisms: transdermal and gastrointestinal.

Transdermal drug delivery administers drugs across the skin, rather than through it. Numerous advantages include improved pharmacological effects, reduced side effects, lower drug dosage, and prolonged delivery (allowing administration once a day or less). The skin's natural barrier properties prevent most drugs from permeating in sufficient quantities to provide a therapeutic effect. TheraTech has developed multi-component penetration enhancers capable of providing superior

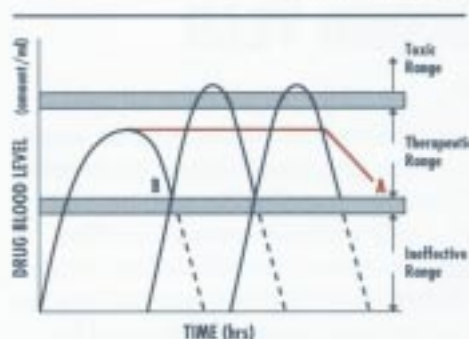
delivery characteristics for a wide range of therapeutic agents. Used with TheraTech's innovative transdermal delivery technologies, the therapeutic benefits of many such drugs can now be realized.

For example, testosterone has traditionally been administered through intra-muscular injections or pellet implantation. In a recent study, TheraTech transdermally delivered approximately

7.5 mg/day of testosterone from 15 cm<sup>2</sup> patches (compared to approximately 2.5 mg/day for other transdermal delivery techniques).

Typically, it is also very difficult to deliver drugs with large molecular weight, especially peptides, across the skin. However, using their enhancer technology, TheraTech has been able to administer an approximately 1200 molecular weight peptide transdermally in humans. This is a significant accomplishment, since heretofore no peptide has been administered transdermally without iontophoresis.

In the area of controlled-release oral dosage forms, TheraTech has worked closely with the Center for Controlled Chemical Delivery (CCCD) at the University of Utah to design new systems that permit dosage forms in a range of delivery



Drug blood level versus time profiles showing the relationship between controlled release (A) and conventional release (B) drug delivery.

(continued)

profiles—including constant delivery, sustained delivery and pulsatile delivery—that can be used for a variety of therapeutic agents.

TheraTech is exploring ways to deliver peptides and peptide analogs in a safe, patient-friendly and cost-effective manner. To enable oral administration, TheraTech is developing unique strategies to prevent the degradation of peptides and enhance peptide absorption in various regions of the gastrointestinal tract. It is also exploring methods of delivering peptides across the oral mucosa, the use of iontophoresis, and biodegradable polymers.

Several of TheraTech's products are already in the human clinical trial phase of product development.

TheraTech has emerged as one of Utah's fastest growing pharmaceutical companies and is internationally recognized as a leader in the development of drug delivery systems. TheraTech is on the verge of significant growth in development of both innovative technologies and pharmaceutical products. On its way to becoming a fully integrated pharmaceutical company, TheraTech is laying plans for expansion of its manufacturing facilities and marketing capabilities.

## OVER 100 INVENTION DISCLOSURES FOR SECOND YEAR

The Technology Transfer Office has received over 100 invention disclosures for the second year in a row. On a national average, one invention is disclosed for every \$2 million of research expenditure. Utah's 105 disclosures on a \$70 million research base is three times this national average.

Every disclosure received some positive action by the Technology Transfer Office, except for those that required additional research. Such action typically includes patent searches, patentability opinions, DataBase mailings to companies, patent filing and licensing. During FY 90, 43 mailings announcing University technologies available for licensing were made, generating over 4,800 contacts. These contacts resulted in the signing of 154 Confidential Disclosure Agreements, representing a significant increase

over last year (103). Of 58 marketable inventions disclosed during FY 90, 11 (19%) were actually licensed in the same year.

A summary of the inventions disclosed to the Technology Transfer Office and the actions taken by it follows:

### SUMMARY OF INVENTION DISCLOSURES

TOTAL DISCLOSURES	105	
Released to Inventors	04	
Pre-Obligated	16	
Needing Further Research	21	
Fusion-related	06	
	47	
TOTAL MARKETABLE INVENTIONS	58	
1990 Inventions Licensed in FY 90	11	
INVENTIONS STILL AVAILABLE	46	
ACTIONS	All Inventions	FY90 Inventions
DataBase Mailings	43	12
Disclosure Agreements		
Signed (Inventions)	154 (60)	37 (15)
Patentability Opinions	34	20
Patent Applications	27	06

## FEDERAL AUDIT HIGHLIGHTS UTAH'S TECHNOLOGY TRANSFER

Universities aren't the only ones seeking to transfer new technologies. The nation's Federal Laboratory system spends many billions annually doing research in a variety of fields at over 400 Federal Laboratories. Recent federal

law has mandated that they effectively transfer their own technology.

Last October, the Inspector General of the U.S. Department of Defense issued an audit of 26 DOD laboratories. The audit concluded that over 75% of the laboratories "lacked an effective marketing strategy". It went on to single out the University of Utah's pro-active marketing efforts, which the report described as "very successful". The audit's final recommendations included implementing a marketing strategy for DOD technologies patterned after the University of Utah's.



Utah's disclosure [rate] is three times the national average.

## THE TECHNOLOGY GRAB BAG

A small sampling of current invention disclosures:

### U-1448 METHOD FOR ENHANCEMENT OF PRODUCTION OF LYMPHOKINES

Inventors: Raymond A. Daynes, Barbara A. Araneo

Selected native steroids have shown immunomodulation of lymphokine production. These steroids have potential applications in immunization, allergy desensitization, aging and treatment of immune system disorders.

### U-1492 AN IMMUNOGLOBULIN BINDING PROTEIN FROM PSEUDOMONAS MALTOPHILIA

Inventor: William Odell

This is a protein that binds all IgG and IgA immunoglobulins in humans and other mammals. Potential uses include identification and purification of immunoglobulins and antibodies, and immune suppression.

### U-1494 BIODEGRADABLE SPLINT

Inventors: A. U. Daniels, Jorge Heller

A fiber reinforced material that may be used for orthopedic devices and appliances that degrade inside the body, thus eliminating the need for additional surgery for their removal.

### U-1496 FUNCTIONALIZED ACETYLENES

Inventors: Peter J. Stang, Charles Crittel, Bobby L. Williamson

The organic synthesis of functionalized acetylenes and a novel precursor alkynylph-

enyliodonium trifluoromethanesulfonates. These compounds may be useful as chemical intermediates, biocides, pharmaceuticals and propellants.

### U-1528 MOLECULAR SEPARATION BY HYDROGELS

Inventors: Sung Wan Kim, You Han Bae, Herman Feil

This novel class of hydrogels can achieve extremely accurate and controllable molecular separation.

### U-1534 HOST VECTOR FOR THE PATHOGEN CANDIDA GLABRATA

Inventor: Dennis Winge

This plasmid propagates in *E. coli* and the yeast *Saccharomyces cerevisiae* and thus can serve as a shuttle vector for the three different species.

### U-1538 IDENTIFICATION OF MICROBES BY DNA-BASED AMINO ACID SIGNATURES

Inventor: Wai Mun Huang

These universal DNA primers allow identification of microbes in samples without the guesswork, lengthy culturing and microscopy normally required. A single probe can simultaneously test for multiple different microbes.

### U-1580 HEPARIN REMOVAL SYSTEM

Inventors: Xing Hang Ma, Syed F. Mohammad, Sung Wan Kim

This system of gels effectively removes heparin from blood without significant affect on hematological parameters, allowing removal of heparin from clinical blood samples.

## \$182,100 PAID TO U INVENTORS

Unlike most private companies, University policy mandates that the economic benefits from inventions be shared with their inventors. The actual percentage is based on a sliding scale from 40% down to 30% of Net Income (Net Income is defined as the total amount of royalties and fees received from an invention, less the costs of patenting it). This year, University inventors were paid a total of \$182,100, which amounts to 29.2% of total royalties and fees received. This amount is slightly less than the 30% minimum

payment specified in the policy because of the investment in patents.

Since the founding of the Technology Transfer Office, more than \$670,000 has been paid to 191 inventors. This amount is almost twice the gross income generated from invention licensing activities during the four years prior to the establishment of the Technology Transfer Office, let alone the portion of that income returned to faculty inventors. Payments to inventors are considered a well-deserved reward for creative ingenuity and an important "fringe benefit" that helps to retain key University faculty. It probably also contributes to the University's top national ranking in invention disclosure.

[Payment to inventors] is almost twice the gross income generated... during the four previous years.