Sector:
Biopharma

Listing: AMEX
Ticker: HEB

Analyst:
Florian Homm

Current Price: 58 7/8
12 -month price target: $25
24 -month price target: $50

HEMISPHERx BIOPHARMA INC.

Research Report
26. April 1999
Recommendation: STRONG BUY

VALUE MANAGEMENT & RESEARCH

HEMISPHERx BIOPHARMA INC.

First and foremost Hemispherx (HEB, American Stock Exchange) has continued to progress since our most recent research update (September 25th, 1999). We therefore reaffirm our medium term price target of US$ 50 and expect the shares to reach new highs this year.

The key developments are outlined below. Nonetheless, the share price has temporarily been hampered by a barrage of negative arguments, largely from one prominent US short seller. In order to proceed with an intelligent assessment of HEB as an investment, it is vital to review the key selling arguments in depth. We have done this in this report. Our assessment of these issues and recent developments reconfirm our Buy recommendation on Hemispherx as an attractive investment proposition on a short and medium term view.

HEB has completed its European filing. We expect non-conditional approval by the first half of next year. European or FDA approval would be an all-important milestone in HEB's development.

The company has also received approval to expand its CFS programs in the United States, another good sign, which should be reflected in increased revenues during the fourth quarter of this year but especially next year. FDA approval appears on schedule for next year. This confirmatory trial is an undertaking to repeat a study performed on 100 severely debilitated CFS sufferers. Under the code of federal regulations, two well controlled clinical studies are required. The new study includes twice as many patients and will last nine rather than six months. Duration of benefit is a central factor to determine quality of life and pharmaco economic viability (savings to the health care system: hospitalization costs, medications, opportunity costs...) and will be key for FDA approval.

The semi-annual meeting of the CFS (Chronic Fatigue Syndrome) interagency committee (National Institutes of Health, FDA, Social Security Administration, Health and Human Services Department) of the US government has met to discuss policy regarding ways to deal with the suffering and debilitation and the growing number of cases of CFS. The meeting has reaffirmed the government's commitment to accelerate drug availability.

Ampligen® continues to be the most advanced and promising drug for the treatment of CFS. No other company has received IND Status or a similar designation for treating CFS. Eli Lilly and Baxter as well as several European companies have attempted treatments, but failed in various phases of development.

Recent scientific investigations appear to suggest that Ampligen® may be useful at preventing AIDS viruses mutation in conjunction with AIDS cocktails. We will keep you posted as we are currently reviewing these developments.

CORE, HEB's hepatitis asset is likely to be spun off in the coming six months. We believe that a value equivalent ranging from $.70 to $1.00 per HEB share could be achieved.

The key share price triggers will be European approval, the CORE Hepatitis spin-off, FDA approval, major updates on the confirmatory clinical trials and new developments in hepatitis treatment and/or diagnosis.

Value Management & Research AG
Am Kronberger Hang 5 • 65824 Schwalbach/Ts.
telephone +49 / 61 96 / 88 00-0 · fax +49 / 61 96 / 88 00-199
VMR SA Madrid, Represent. offices in London and San Francisco

VALUE MANAGEMENT & RESEARCH

http://www.vmr.de
Bloomberg: VMR <Go>
E-Mail: mkind@vmr.de

Company Summary

Hemispherx Biopharma, Inc. ("Hemispherx" or the "Company") is a biopharmaceutical company that focuses on the development of nucleic acids to enhance the natural anti-viral defense systems of the human body. The Company's lead product, Ampligen®, is presently undergoing phase III clinical trials in the United States and Europe for the treatment of Chronic Fatigue Syndrome(CFS), also known as Chronic Fatigue and Immune Dysfunctional Syndrome (CFIDS) or, in Europe, Myalgic Encephalomyelitis (ME), a disease suffered by several hundreds of thousands of people worldwide for which there is no known cure or alternative treatment. The stock of the Company is listed on the American Stock Exchange (HEB), the Frankfurt Stock Exchange (HXB) and the Berlin Stock Exchange (HXB). Hemispherx also has conducted clinical trials of treatments for other infectious diseases such as Hepatitis B and HIV; and clinical trials for renal cell carcinoma and malignant melanoma. Hemispherx has patented Poly A:Poly U, which is in advanced clinical trials primarily conducted by a major European pharmaceutical company for treatment of Hepatitis B and C. Hemispherx also has licensed a series of patents on Oragen™ compounds, broad-spectrum oral anti-viral drug therapies developed at Temple University and indicated its intention to further expand its anti hepatitis drug portfolio through strategic acquisitions.

The initial concentration of Hemispherx is on Ampligen® as a treatment for CFS/ME, a disease for which there are no competitive treatments. The Company is rapidly developing Ampligen® to gain regulatory approvals and commercial applications in the United States and Europe. Significant recent events include:

- The FDA recently authorized the expansion of the Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS) Cost Recovery Treatment Program in the second quarter of 1999 from 50 patients to more than 100 patients.
- Hemispherx filed for approval of Ampligen® for the treatment of CFS/ME in the European Union on December 1, 1998. On February 4, 1999, Hemispherx application cleared the first stage of regulatory review by being designated "complete" by the European Medical Evaluation Agency (EMEA). This designation indicates that the extensive data and analysis submitted in support of the application are sufficient for the review process to proceed to advanced stages.
- The Company initiated the recruitment of clinical investigators and ME/CFS patients to participate in the confirmatory Phase III placebo-controlled clinical study of Ampligen® in the treatment of persons suffering from ME/CFS using top experts at more than 10 major medical centers in the U.S. The Company has a target of eventually enrolling 230 patients with the most severely debilitating form of ME/CFS. The Company began enrollment of a significant number of subjects into the pre-clinical or baseline phase of the study in January and February 1999.
- In early spring 1998, the Company entered into a research collaboration agreement with R.E.D. Laboratories, a Belgium company dedicated to the development and commercialization of CFS diagnostics. R.E.D. has developed a new test, designated REDD, that appears to be the first diagnostic to identify a subset of CFS patients who are severely ill with ME/CFS disorders. The Company plans to use the test in the United States on a research basis during 1999 to identify patients who may respond dramatically to Ampligen®.

- In February 1998, the Company entered into an agreement with Kimberly Home Health Care, Inc. d/b/a Olsten Health Services ("Olsten"). Olsten is one of the largest health care providers in the U.S. with medical staff exceeding 300,000. This agreement appoints Olsten as a distributor of products to U.S. patients enrolled in the ME/CFS cost recovery treatment program (AMP 511). Olsten agreed to provide initially up to $500,000 of financial as well as staff support for other clinical trial efforts including identification of medical and economic benefits to patients receiving Ampligen®.
- The Company has entered research agreements with LabCorp., a subsidiary of Laboratory Corporation of America (NYSE/LH) and Workwell Corporation to provide high quality diagnostic data during the Phase III study. LabCorp will carry out laboratory diagnostics tests on samples sent from clinical trial sites to its location in Raritan, NJ. Workwell will monitor treadmill exercise performance and oxygen consumption at each clinical trial center. Testing for a specific biochemical marker (RNase L) will be done by R.E.D. Laboratories, an affiliated company, in Brussels.
- A liquid formulation process for Ampligen® was initiated at Cook Imaging, a major U.S.-based facility for preparing large volume parenteral drug products under GMP ("Good Manufacturing Practice"). This liquid process is more efficient and allows for greater volume manufacturing production needed to meet projected requirements. Results with the product liquid format to date have been encouraging with respect to product stability and ease of handling. The liquid formulation format also eliminates the need for a major pharmacy function nearby the clinical treatment site and will facilitate accelerated market penetration.
- The Company completed six months of accelerated and long term stability studies on the liquid formulation product produced by Cook Imaging. These stability studies on liquid formulated product are required by the FDA. In December, 1998, the Company started treating ME/CFS patients in the United States with the ready to use liquid formulation.
- The Company continued to increase the in-house clinical, regulatory and bio-statistical expertise necessary to direct and support the clinical programs underway by acquisition of senior pharmaceutical staff. A Director of Clinical Operations was recruited from a major multinational, independent clinical research organization to oversee the Company's clinical activity. Prior to his recruitment, these duties were performed by the Medical Director with assistance from the clinical research associate (CRA) staff of the Company and its strategic partner, Olsten Health Care.
- The Company recently appointed Dr. Evelyn Deschamps, M.D., formerly Medical Director of a major privately held multi-national pharmaceutical company as well as Air France, as its Chief Medical Officer for pan-European operations. Dr. Deschamps is overseeing the Company's significant expansion in staffing and clinical programs in Europe during 1999.
- R.E.D. Laboratories of Brussels, Belgium reported significant progress in developing a diagnostic test for ME/CFS. The testing platform is based on the measurement of an abnormal form of the protein RNase L, an antiviral enzyme found in the white blood cells of CFS patients. This abnormal enzyme was first discovered in 1996 by researchers at Temple University who have been actively collaborating with the Company's scientists for a number of years. Initial research data indicates a high degree of correlation between levels of the enzyme and the severity of the disease. These results, along with treating ME/CFS patients with Ampligen®, were presented to enthusiastic audiences at the American Association of CFS Meeting in Cambridge, Massachusetts, October, 1998. We understand publication of the results in a prestigious American medical journal will occur shortly. Also, two forthcoming international CFS conferences in London and Brussels will showcase the data in late April ("Fatigue 2000") and early September 1999. The diagnostic capabilities of physicians in the European Union will be enhanced substantially by these two conferences.

The Company

Dr. William A. Carter, M.D., the Chief Executive Officer of Hemispherx, has focused the Company's attention on the development of nucleic acids for treating viral diseases and disorders of the immune system over the past two decades. Dr. Carter originally pioneered the clinical development of interferon, a protein therapy now approved for over twenty different illnesses with a global market in excess of $2 billion. Hemispherx has established a strong foundation of laboratory, pre-clinical and clinical data to commercialize its portfolio of nucleic acid drugs for the treatment of viral diseases, immune system dysfunction and certain cancers. Hemispherx's proprietary drug technology uses specifically configured ribonucleic acid (RNA) targeting the human body's natural antiviral defense system

The Company has secured a significant patent estate consisting of 24 patents issued in the United States and over 300 international filings. These patents primarily cover the Company's technology platform that involves nucleic acid polymers that have specifically configured base pairs. The Company's policy is to file or license existing patent applications on a worldwide basis to protect technology and improvements that are considered important in the development and protection of the Company's core business.

Ampligen®

Hemispherx has conducted research in the biopharmaceutical field for over 25 years primarily working with nucleic acid polymers that have specifically configured base pairs. In the early 1970s, scientists discovered that nucleic acid polymers that were generated by viral infection were inducers of antiviral interferons in the human body. Thereafter, Dr. Carter, and his associates discovered that certain synthetic double stranded RNA species were also inducers of antiviral interferons. Dr. Carter pioneered the interferon field while at Johns Hopkins University and the National Institute of Health.

Early work revealed that a certain promising type of double stranded RNA was toxic to humans. But the scientists discovered that a modified form of this RNA had interferon-inducing qualities without the toxicity. Hemispherx named this latter substance Ampligen®, which it patented and developed as an alternative to interferon. Ampligen® is a substance that is believed to bring about anti-viral activity in the human body. It is thought to activate the intracellular defense systems, and it appears to stimulate the human immune system by stimulating the production of natural interferon and other natural substances that enable the body to counteract viral infections. The primary objective of Hemispherx became the development of therapeutic applications for Ampligen® and its derivations.

Ampligen® is a type of double stranded Ribonucleic Acid (RNA). The Company has developed a large body of knowledge in the development and testing of this therapeutic product brand of nucleic acid technologies. Ampligen® has been clinically evaluated as an investigational drug in over 350 patients for different therapeutic indications. The clinical profile that is emerging from these studies is that the drug has broad-spectrum antiviral and immune modulatory activity and is generally well tolerated.

There have been numerous business school studies that look at the relationship between product development time and duration of product life in the marketplace. Here, one is reminded of Corning's development of the fiberoptic cable (which spawned MCI) or Xerox's development of photocopying technology. Both took decades to develop but resulted in remarkably durable product platforms. Ampligen® appears to being following this same path.

Ampligen® is being developed clinically for use in treating three anti-viral indications: myalgic encephalomyelitis, also known as chronic fatigue syndrome ("ME/CFS"), chronic hepatitis B virus ("HBV") infection, and human immunodeficiency virus ("HIV") associated disorders. Also, the Company has clinical experience with treating patients with certain cancers. The Company's business strategy is designed around seeking the required regulatory approvals which will allow the progressive introduction of Ampligen® for ME/CFS and HIV followed by HBV in the U.S., Canada, Europe and Japan. Ampligen® has received Orphan Drug designation from the FDA for four indications (HIV, renal cell carcinoma, chronic fatigue syndrome and invasive malignant melanoma).

In Europe, the Company is already making major strides in pre-marketing product development programs by meeting with professional, research and scientific leaders and conducting international educational symposiums which we have attended. Palpable enthusiasm was shown for the product in a recent meeting in Rome, Italy, with leaders from approximately 12 EU countries.

The Company is currently conducting several clinical trials to determine the efficacy of Ampligen® for the treatment of ME/CFS. A confirmatory Phase III, randomized, double-blind clinical trial is underway in the United States and a Phase II/III open-label study is being conducted in Belgium. In addition to the confirmatory Phase III clinical trial in the United States, the Food and Drug Administration (FDA) has approved the enrollment of ME/CFS patients in the confirmatory cost recovery treatment program.

Chronic Fatigue Syndrome ("CFS")

Market for Chronic Fatigue Syndrome is overestimated

A research group at the Harvard Medical School led by Dr. Anthony Komaroff (now Editor and Chief of Harvard University Medical Publications) studied the prevalence of Chronic Fatigue Syndrome ("CFS") in the U.S. and published their findings in the peer reviewed medical journal, Annals of Internal Medicine, in July of 1995 entitled *Chronic Fatigue and the Chronic Fatigue Syndrome*, Volume 123. They determined that the previous estimate of the number of people with CFS in the United States had been grossly underestimated by the Centers for Disease Control (CDC). The Harvard Medical School study estimates that there are 75 to 267 cases of CFS per 100,000 people in the general population of the United States. In 1994 and 1995, the leading researcher for the Centers For Disease Control, in testimony before the United States Congress, under oath, addressed the old study testifying "that we had probably been wrong". This researcher acknowledged in his Congressional testimony that the disease was much more prevalent than the original study of the Center for Disease Control, and further acknowledged in his testimony that he believed that the ongoing work from Harvard Medical School was the accurate work on the incidence of the disease. Indeed, the CDC has acknowledged that their first estimate of the number of persons suffering with CFS was probably inaccurate. A new CDC study published in Chronic Fatigue Syndrome, U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, October 1998, estimated that as many as 200 individuals per 100,000 have CFS.

Based on the current U.S. population of 260 million, the estimated mean point number of CFS sufferers in the United States follows:

New CDC estimate	520,000
Mean Harvard Medical School estimate	445,000
Mean Estimate from both Studies	482,500

Further, disability claims for CFS have increased 900% over the last five years in the U.S.(see, *Kimberly Lankford, Enormous Employer Disability Costs, Life Association News, Vol. 92:1, 36 (Jan. 1997)*). These estimates do not even include the prevalence rates for CFS sufferers worldwide.

Chronic Fatigue Syndrome is not a disease

Chronic Fatigue Syndrome (CFS), also referred to as myalgic encephalomyelitis, low natural killer cell disease, and as Chronic Fatigue Immune Dysfunction Syndrome or CFIDS, is a discrete, specific disease usually with an abrupt onset of symptoms that wax and wane for at least six months. These symptoms, according to the CDC, include fever, sore throat, painful lymph nodes early in the disease, muscle weakness, headaches, joint pain, sleep disturbances, and intellectual impairment. CFS is now accepted by the leading CFS researchers, the CDC, and most knowledgeable physicians as a genuine clinical condition. Although the etiology, or cause, of CFS is not completely understood, it has been postulated that because of the similarity of the early stage symptoms of CFS and the normal symptoms of common flu-like viruses, CFS also is initiated by a virus. Unlike those other common ailments, however, CFS persists for months, often years, with measurable immune system impairment including lower levels of natural killer cell activity and/or lower lymphocyte counts. Additionally, CFS is associated, although not in every case, with chronic elevated serum levels of various cytokines, such as IL-2 and interferon, which are associated with bodily defenses, and which are known to produce symptoms similar to those described for CFS. In many cases, reactivation of a common childhood herpes virus, Human Herpes Virus 6 (HHV-6) has been documented. Evidence for glucocorticoid deficiency in CFS has also been obtained.

In 1994, the Center for Disease Control classified CFS as Priority 1 on its list of new and reemerging infectious diseases, equivalent in severity to AIDS, drug resistant TB, and Lyme Disease, and has delineated a very precise case definition for the disease.

The current summary of the working case definition of CFS established by the CDC in 1994 requires a thorough medical history, physical examination, mental status examination, and laboratory tests to be conducted to identify underlying or contributing conditions that require treatment. Diagnosis or classification cannot be made without such an evaluation. Clinically evaluated, unexplained chronic fatigue cases can be classified as CFS if the patient meets both the following criteria:

(1) Clinically evaluated, unexplained persistent or relapsing chronic fatigue that is of new or definite onset (i.e., not lifelong), is not the result of ongoing exertion, is not substantially alleviated by rest, and results in substantial reduction in previous levels of occupational, educational, social, or personal activities.

(2) The concurrent occurrence of four or more of the following symptoms. These symptoms must have persisted or recurred during six or more consecutive months of illness and must not have predated the fatigue: substantial impairment in short-term memory or concentration; sore throat; tender lymph nodes; muscle pain; multi joint pain without swelling or redness; headaches of a new type, pattern, or severity; unrefreshing sleep; post exertional malaise lasting more than 24 hours.

Table 1. Frequency of Symptoms and Signs in Patients with Chronic Fatigue Syndrome

Symptom/Sign	Frequency (%)
Fatigue	100
Myalgia	83-91
Headaches	81-93
Difficulty in concentrating	79-88
Recurrent Pharyngitis	73-83
Swollen lymph glands	71-86
Difficulty in sleeping	55-66
Anxiety	70-71
Depression or unusual mood changes	67-72
Joint pain	67-82
Cough	50-54
Recurrent fevers at home	43-54
Nausea	48-62
Stomach ache	45-51
Loss of appetite	36-38
Odd sensations in the skin	40-68
Intermittent swelling of the fingers	44-55
Diarrhea	33-42

As part of its protocol, Hemispherx requires CFS patients participating in its clinical trials to exceed the minimum criteria established by the CDC in part (2) of its case definition.

Not only does the CDC recognize CFS as a insidious disease, but the medical, legal and governmental communities do as well for example:

The Federal United States Court of Appeals, in *Mitchell v. Eastman Kodak Company*, 113 F. 3d 433, (3rd Cir. 1997),determined that CFS is indeed an infectious disease upon which an individual can receive long term disability benefits under his employers insurance plan. The court stated that "chronic and unpredictable fatigue made it impossible for him to sustain regular employment" and that "[he] was totally disabled from gainful employment because of his CFS".

The Social Security Administration has recognized CFS as a disease which enables a sufferer to collect disability benefits. Section 223(d)(5)(A) of the Social Security Act requires proof of a disability by medically acceptable clinical or laboratory tests and routinely allow benefits for CFS even though there is no "dipstick laboratory test" (see *Sisco v. U.S. Dept. of Health and Human Services*, 10 F. 3d 739 (10th Cir. 1993)). The Social Security Administration's manual lists chronic fatigue syndrome as a disease and benefits are awarded on a case by case basis even though the etiology and pathology have not been established.

Further, the notion that a complete cure must be demonstrated to have an approvable drug is incorrect. Two examples of drugs approved for use but without completely curative features are Prozac and Interferon. Prozac is a multi billion dollar drug sold for the treatment of depression. Depression is a diagnosis made on clinical grounds. There is not etiologic agent and the origin of the problem cannot be traced. The manufacturer does not represent that Prozac ever cured anybody of depression, and, in fact, the studies of Prozac lasted about five to six weeks. Many of the patients reported via questionnaire that their symptoms were relieved. On the basis of this information, this drug was platformed to become a multi-billion dollar drug. In the field of chronic hepatitis B therapy, Schering-Plough Corporation previously has obtained final approval for and is marketing Intron-A (alpha interferon). However, 60% to 75% of patients with chronic hepatitis B ultimately fail to respond to interferon-alpha. The global sales of interferon are presently estimated at more than $2 billion annually.

Ampligen® filing status misrepresented

The Company is currently conducting several clinical trials to determine the efficacy of Ampligen® for the treatment of ME/CFS. A confirmatory Phase III, randomized, double-blind clinical trial is underway in the United States and a Phase II/III open-label study is being conducted in Belgium. In addition to the confirmatory Phase III clinical trial in the United States, the Food and Drug Administration (FDA) has approved the enrollment of ME/CFS patients in the open label cost recovery treatment program. Patients enrolled in the cost recovery treatment program reimburse the Company for the cost of the drug. We have examined, under confidential agreement, the actual FDA authorization documents which are accurately represented in the Company releases.

The U.S. Food and Drug Administration has granted Hemispherx "orphan drug status" for its nucleic acid-derived therapeutics for CFS/ME, HIV, and renal cell carcinoma and malignant melanoma, thus giving the Company what is potentially a "legal monopoly". Orphan drug status grants the Company protection against competition for a period of seven years following FDA approval, as well as certain tax incentives

There are only approximately 60 such drugs in the entire universe of new drugs under development for many different diseases, including Alzheimer's disease, metastatic breast Cancer, HIV disease, etc., which have been given cost recovery designation by the Food & Drug Administration since 1990. Ampligen® is the only drug that has been given this designation for Chronic Fatigue Syndrome. The history of drugs given cost recovery designation has been favorable and most have gone on to full approval.

An FDA white paper published in May 1998, by a joint committee called the Chronic Fatigue Research Committee, consisting of the National Institutes of Health, the Centers For Disease Control, the Department of Health & Human Services, The Social Security Disability Administration, and the FDA, the major overseeing agencies in the United States with respect to infectious diseases, provides the most comprehensive statement on Ampligen® and CFS. In the paper. The paper states categorically that (1) Chronic Fatigue Syndrome is a serious and life threatening disease for which they were moving quickly to try to improve diagnostics and therapeutics, and that (2) at this time the only drug in advanced testing and the only drug which had been given cost recovery treatment status was Ampligen®, a Phase III classification.

On December 1, 1998, Hemispherx filed for approval of Ampligen® for the treatment of CFS/ME in the European Union. On February 4, 1999, Hemispherx's application cleared the first stage of regulatory review by being designated "complete" by the European Medical Evaluation Agency (EMEA). This designation indicates that the extensive data and analysis submitted in support of the application are sufficient for the review process to proceed to advanced stages. The application is for approval as an "orphan drug", which lowers the threshold somewhat. The European Union is establishing a separate approval process for orphan drugs. In Europe, orphan drug approval is expected to be tantamount to full approval. Based on expected turnaround time and the positive results of its tests of Ampligen®, there is the possibility

Ampligen® Phase II trials misrepresented

Phase II trials to study the safety and efficacy of Ampligen® as a drug for the treatment of Chronic Fatigue Syndrome have been completed successfully. The design of such trials is to evaluate improvements following Ampligen® treatment over the condition of a CFS patient before treatment. Cure is not the definition of efficacy, and in fact, it is difficult at this time to define a long-term cure because there are several symptoms in Chronic Fatigue Syndrome. People are studied over long periods of time and test results have been very encouraging as presented at the International Symposium on Chronic Fatigue Syndrome in Cambridge, Massachusetts, in November 1999, co-sponsored by the Massachusetts Medical Society and Harvard Medical School.

Testing for Ampligen® with CFS patients examines statistical improvement in physical performance, mental skills, etc., and generally the constellation of activities medically classified as "the quality of life". The Karnofsky Performance Score (KPS) is a global evaluation of the patient's ability to conduct daily activities, including work activities and self care activities. The KPS is sensitive to effective therapeutic intervention in chronic disease states and is designed based on a 100 point scale with 100 equating to normal activity; no complaints; no evidence of disease; 50 equating to requiring considerable assistance for daily care; and 0 equating to death. All studies have shown statistical significance for the drugs performance at these levels. To summarize these studies:

Four separate Phase II clinical trials of Ampligen® therapy have been conducted in CFS using more than 200 patients for a period of six months or more. Some patients have received the drug for two years or more with excellent results, both with respect to safety and efficacy. The first study (Study A) was an open-label study conducted at Incline Village in Nevada. Study B is being conducted by at the University of Brussels and is ongoing. Study C was a randomized, placebo-controlled trial at four sites in the United States. Study D is a cost-recovery program authorized by the FDA and is also ongoing. The Karnofsky Performance Score is a recognized measure of physical performance and was utilized in all four Ampligen® studies. The mean KPS score at baseline across the four studies was 51.6. This means that the average patient required considerable assistance for carrying out every day activities such as cooking and cleaning.

In study A, the mean KPS improved from 47 at baseline to 80 at Week 24 which was highly statistically significant. After 24 weeks of therapy, significant improvement in cognitive deficit was seen. A decrease in cognitive deficit implies an improvement in the patient's perception of their cognitive abilities. In Study A Physical Performance was quantified using Treadmill Exercise. After 24 weeks of Ampligen® therapy there was a 48 percent improvement in exercise duration which was statistically significant. This indicates the drug had a so called "macroeconomic benefit" in that a bedridden patient was now able to return to gainful employment and have a restored quality of life.

In Study B, KPS scores have also improved significantly from a mean of 54 at baseline to 71 at week 24. Improvement in Cognition has also been seen in the Belgium study. After 24 weeks the mean cognitive deficit score improved significantly by decreasing towards the normal range. Using a bicycle ergometer, there has seen an 18% improvement in maximal work output after 24 weeks. The difference is statistically significant.

In both studies A and B the therapy was generally well tolerated, and there were no clinically significant abnormalities in laboratory blood studies.

In study C, the randomized, placebo-controlled trial, there was a 20% improvement in the primary endpoint, KPS in the Ampligen® arm vs. a 0% change with placebo. This was statistically significant with a p=.02. There was also significant improvement in the cognitive deficit subscale within the SCL-90-R, as well as in the treadmill exercise duration. Ampligen® was generally well-tolerated and there were no significant increases in abnormal laboratory values in the Ampligen® group vs. placebo group. There was also no significant difference in the number of adverse events in the Ampligen® group compared to placebo and no significant differences except for dry skin in the drug group and insomnia in the placebo group, and these were thought to have resulted from chance alone. Ampligen® treatment resulted in a decrease in RNase L towards normal in CFS subjects who presented with elevated levels at baseline. The decrease in RNase L activity was seen in 80% of the Ampligen® patients compared to 35% of the placebo patients and this was statistically significant. RNase L activity actually increased further in the placebo patients. Moreover, following 24 weeks of Ampligen® treatment there was a high correlation between the decrease in RNase L and Cognitive Improvement. Following the 24 weeks of double-blind treatment, two groups of patients participated in an open-label extension phase of Study C. Group A participation required a KPS and/or cognition improvement, while Group B participation required no specific improvement. Continued KPS improvements were seen for both Groups A and B during the extension phase of Study C. For Groups A and B the KPS improvements seen at the end of the study were 31 and 26 KPS units.

In Study D, Mean Daily Activity increased over 20% following 16 and 24 weeks of Ampligen® treatment in the cost-recovery program. Moreover, there was an excellent correlation between the changes seen in KPS following Ampligen® treatment and the changes in Daily Activity Counts recorded by the Activity Monitors. This recently added quantitative evaluation tool, the Actigraph, is a solid state electronic device worn on the waist, digitally measures physical motion over a period of time to determine a patients improved performance, if any.

Ampligen® is toxic

There are now several hundred trial months of experience treating people in the United States and Europe with Ampligen®. In one current analysis, one hundred forty-six (146) patients have been treated with Ampligen®. Out of the two hundred and four (204) patients with CFS, 160 (78%) have enrolled in the United States and 44 (22%) were enrolled in Belgium. A detailed statistical analysis of adverse reactions showed no increase in the frequency of symptoms in the Ampligen® group compared to the placebo group. The total number of adverse events reported by patients receiving Ampligen® was virtually identical to that reported by patients receiving placebo (706 vs. 711; p>.90).

	Number of Patients	Adverse Event* Number of Reports
Ampligen®	45	706
Placebo	47	711

* *An adverse event is a side-effect which may be due to the disease itself or the therapeutic intervention*

When the relative frequencies of each of more than 200 specific adverse-event categories were compared, no statistically significant differences between groups were found except in the case of insomnia (whose incidence was higher among placebo patients) and dry skin (whose incidence was higher among Ampligen® recipients). Moreover, since more than 200 statistical comparisons were made, the finding of two adverse-event categories below the $P = .05$ level was expected on the basis of chance alone. An extensive analysis showed no evidence that this study was unblinded.

According to the Code of Federal Regulations, the FDA does not allow clinical tests to occur and to continue if a drug is not reasonably safe at the dosage being used. The FDA has stated that if there was an issue of product safety the drug is put on "clinical hold" until the scientific issues are resolved. Hemispherx has never been put on clinical hold with respect to Ampligen®. Hemispherx has been allowed to expand its clinical trials very dramatically. If any of the Regulatory Agencies had concerns about the safety of Ampligen® the drug would not be exposed to the American population. The Company has no letters from the FDA evidencing any concern for toxicity and, indeed, the FDA is allowing further expansion of a variety of trials that the Company is conducting with respect to Chronic Fatigue Syndrome. Indeed, more than 350 patients were authorized for treatment as of April 8, 1999, evidencing satisfaction of the regulatory authorities with exposing incremental numbers of patients to the drug for potential long-term benefit.

Lack of Patent coverage

The Company has filed more than 340 patent applications involving chemistry, processes, biological insights and specific target-oriented compositions of matter worldwide covering its RNA technology, including, Ampligen®. The patent coverage for Ampligen® is extensive numbering 250 which covers all of the drugs commercial venues and uses including CFS. Hemispherx has 24 filings with the U.S. Patent Trademark Office and more than 312 corresponding foreign patent applications in other countries, such as members of the European Patent Convention, Japan, South Korea, Australia. The Company, as a matter of policy, seeks patent protection in each of the three major geographic markets: the United States, Europe, and the Pacific Rim. Of the patent applications filed worldwide, over 282 have been issued (including 18 in the United States). According to *Nature Biotechnology*, Hemispherx has one of the largest patent estates in the entire biotechnology universe consisting of nearly 1,500 companies.

The Company's patent coverage related to CFS totals 77 including the recent approval in the U.S. of a broad patent for diagnosing and treating viral infections associated with Chronic Fatigue. The patent operates to correct specific molecular deficits in the immune system of CFS sufferers. Since a potential competitor would have to identify a wholly new biochemical defect in CFS, Hemispherx's new patent would seem to preclude any serious pharmaceutical competition using double stranded RNA for the forseeable future.

Failed Dupont trials

The Company and Dupont entered into a partnership to study Ampligen® treatment for HIV in 1987. The Company was dissatisfied with Dupont's performance, sought termination, and a lawsuit and counter suit ensued. An out-of-court settlement was agreed to in which Hemispherx and Dr. Carter were paid approximately $8 million by Dupont. Dupont was forced to disgorge their stock in Hemispherx. The Company and Dr. Carter were cleared of all charges of any impropriety. A blue-ribbon committee of government appointed scientist and administrators investigated these matters and subsequently the National Institute of Health issued a report which acknowledged that Dupont had made scientific errors in the packaging of the drug.

Ampligen® has no worth

There are several scientific papers which indicate promising activity for Ampligen® along a range of immunological diseases. The NIH has invested several millions of dollars, based on a peer review process involving numerous distinguished scientists from around the country, and have consistently found a basis for funding this RNA technology over the years because of their belief that it represented a significant opportunity into certain disease categories for which there was no treatment. Significant investments have been made by the Federal Government, measuring in multi-millions of dollars, based on peer review, due diligence, and investigation by well respected scientists over time. All have found the data with respect to this technology to be promising and worthy of research investment.

The Federal Government through the FDA has decided that it is appropriate to charge patients for treatment under a cost-recovery program based on substantial due diligence having to do with a potential for the drugs benefit, and examining the issue of drug side effects.

Further, a recent independent investment research report dated February 11, 1999, by the U.S. investment banking firm of Clayton Dunning & Company, Inc. (the "Clayton Dunning Report") has determined the market potential for the drug Ampligen® to be worth several hundred million dollars. In fact, one of the author's of the report is a former "all-American" analyst based on the predictive qualities of his research work.

Relationship with unsavory brokerage firm for IPO

At the time of the Company's initial public offering, its underwriter, Stratton Oakmont, was a member in good standing with NASD and the offering was allowed to proceed. The IPO received very rapid and successful review and clearance by the SEC and the NASD. One of the largest and most distinguished law firms in the United States, Fulbright & Jaworski, opined on the accuracy of the Company's statements and consented to the filing of the registration statement before the stock was made available to the public. One of the six largest accounting firms in the world, KPMG Peat Marwick further opined on the accuracy of the financial statements, and consented to the filing of the registration statement. Hemispherx has never received any notification, by letter or a phone call, from the Securities & Exchange Commission or the NASD concerning any actions that it had with respect to the public offering or thereafter. The Company obtained a general release from Stratton Oakmont shortly after the public offering and prior to the full development of the Stratton problems. Hemispherx was never involved in any problem with Stratton Oakmont, the SEC, the NASD or any public shareholders.

In addition to the professional legal and accounting relationships established above, the Company has established several strong relationships with major industrial, financial, legal, medical and university organizations including its long standing relationships with Temple University and with Bioclones Proprietary Ltd., a biopharmaceutical company associated with South African Breweries Ltd, a large publicly traded multinational company.

Recently, the Company has established relationships with several other In early spring 1998, the Company entered into a research collaboration agreement with R.E.D. Laboratories, a Belgium company dedicated to the development and commercialization of CFS diagnostics. In February 1998, the Company entered into an agreement with Kimberly Home Health Care, Inc. d/b/a Olsten Health Services ("Olsten"). This agreement appoints Olsten as a distributor of products to U.S. patients enrolled in the ME/CFS cost recovery treatment program. The Company has entered research agreements with LabCorp., a subsidiary of Laboratory Corporation of America (NYSE/LH) and Workwell Corporation to provide high quality diagnostic data during the Phase III study. A liquid formulation process for Ampligen® was initiated at Cook Imaging, a major U.S.-based facility for preparing large volume parenteral drug products under GMP ("Good Manufacturing Practice").

Improper warrant exercises

Hemispherx has a policy of granting warrants as an incentive compensation to key employees and to certain non-employees providing valuable services to the Company. The Company discloses the exercise of such warrants as required by Generally Accepted Accounting Principles ("GAAP") pursuant to Statement of Financial Accounting Standards No. 123 (SFAS 123) Accounting for Stock-Based Compensation which requires the per share weighted average fair value of the stock purchase warrants granted to be determined using the Black-Scholes option pricing model. The exercise price of all warrants granted in all cases is equal to the fair market value as defined by APB 25 on the date of the grant. Warrants granted to employees are non-public and contain a vesting period that ranges from one to three years from the date of grant. Such warrants must be registered with the Securities and Exchange Commission ("SEC") before the underlying shares can trade on the public market. At this point, the Company has not registered any employee warrant holders shares.

Outstanding warrants with a price at exercise below the market price does not mean the grants of such warrants were improper or imprudent. Such warrants were normally granted during prior periods when the market price for the Company's stock was lower. No warrants have been exercised by officers or directors of the Company.

In November 7, 1995, the Company completed an initial public offering (IPO) of 5,313,000 units of Hemispherx resulting in net proceeds of approximately $15.8 million. Each unit consisted of one share of the Company's Common Stock and one Class A Redeemable Warrant, exercisable for one share of Common Stock at $4.00 per share, above the then market price for the Company's securities. In July 1996, the Company split the publicly traded unit and the separate trading of the common stock and the warrant commenced. Some non-fiduciary employees may have acquired some class A warrants in the open market.

Such warrant and option programs, the Company believes, are worthwhile incentives to reward the contributions of valued personnel to the Company. In addition, the Company has been able to raise significant capital due to the exercise of such options and warrants which enables the Company to fund its ongoing clinical trials, marketing development and programs.

Further, no officer or director of the Company has profited materially from the sale of shares, in fact, less than 80,000 shares in the aggregate have been sold in 1998. The major shareholder of the Company, its CEO, has purchased shares throughout the year without a single sale.

Small trial sizes

Clinical trials conducted by the Company are undertaken with regard to strict compliance to federal and governmental guidelines. Before a new drug product may be sold commercially in the U.S. and other countries, clinical trials of the product must be conducted and results submitted to the appropriate regulatory agencies as part of the approval process. The Company's therapeutic and diagnostic products are subject to regulation in the U.S. under the Food, Drug and Cosmetic Act (the "FDC Act"). Ampligen® and other RNA drugs are reviewed as new drugs by the FDA's Center for Drug Evaluation and Research ("CDER"). The steps required before a non-biological drug product may be marketed in the U.S. include (a) conducting appropriate pre-clinical laboratory and animal tests, (b) submitting to the FDA an application for an Investigational New Drug ("IND"), which must become effective before human clinical trials may commence, (c) conducting well-controlled human clinical trials which establish the safety and efficacy of the drug product, (d) filing a New Drug Application ("NDA") with the FDA, and (e) obtaining FDA approval of the NDA prior to any commercial sale or shipment of the drug. Clinical trials involve the administration of the investigational drug product to human subjects. Clinical trials typically are conducted in three phases and are subject to detailed protocols. Each protocol indicating how the clinical trial will be conducted must usually be submitted for review to the FDA as part of the IND.

The sample size for the original marketing approval of Schering Plough's Intron-A for Hepatitis B was based on 40 patients. Several antiviral drugs (anti-HIV) have received conditional marketing approval based on patient trial sizes of less than 20 for a period of less than 8 weeks of treatment.

A major consideration of most clinical studies is to determine whether the drug under investigation is effective and safe. During the planning stage of a clinical study, the following question is of particular interest to the investigators: How many subjects are needed to have a desired power chance of correctly detecting a clinically meaningful treatment difference? To address this question, a statistical evaluation for sample size determination or justification is often employed. Sample size determination usually involves the calculation of a required sample size for some desired statistical properties such as precision and power, whereas sample size justification provides statistical justification for a selected sample size which may be small in number because of some medical or budget constraints. The sample size in a clinical trial is usually determined by the primary objective of the trial and can be dramatically different for different trials.

The Company conducts all its trials with sample sizes that are statistically representative of the phase trial conducted to receive approval and to proceed to the next phase or final drug approval. Since protocols are submitted for approval to the FDA, the FDA has approved of the sampling sizes used in the Company's clinical trials and has granted approval for the Company to move to the next clinical phase trials thereby approving the concluded trials and respective sample sizes.

No NDA application and extremely limited cost recovery

As noted above, the filing of an NDA occurs after Phase III clinical trials. Hemispherx has a full marketing application pending in the EU with a potential market size of 500,000 patients or more. Reports of results of the pre-clinical studies and clinical trials for non-biological drugs are submitted to the FDA in the form of an NDA for approval of the marketing and commercial shipment. The NDA also includes information pertaining to the preparation of drug substances, analytical methods, drug product formulation, details on the manufacture of finished product as well as proposed product packaging and labeling. Submission of an NDA does not assure FDA approval for marketing. In general, the FDA requires at least two properly conducted, adequate and well-controlled clinical studies demonstrating efficacy with sufficient levels of statistical assurance. However, additional information may be required. For example, the FDA also may request long-term toxicity studies or other studies relating to product safety or efficacy. Finally, the FDA may require additional clinical tests following NDA approval to confirm product safety and efficacy (Phase IV clinical tests).

The Food and Drug Administration has approved the enrollment of ME/CFS patients in the open label cost recovery treatment program with a series of escalations including the recently approved 100% expansion of the treatment protocol. Patients enrolled in the cost recovery treatment program reimburse the Company for the cost of the drug. The program has been newly enrolled and participation in the program by CFS sufferers continues to expand at the Company's clinical trial sites. The Company recently received FDA approval to expand this program by another 65 patients so that total enrollment will increase to more than 100.

Manufacturing

Drug intermediates used in the production of Ampligen® are currently manufactured from raw materials produced by Pharmacia Biotech, formerly a division of Pharmacia-Upjohn and now a subsidiary of Procardia, a major multinational pharmaceutical company (Pharmacia holds a minority equity interest in Hemispherx), and Bioclones Proprietary Limited, a biopharmaceutical subsidiary of The South African Breweries Ltd. (SAB). The intermediates are analyzed by Hemispherx for compliance with specifications and then transferred to two manufacturers, Cook Imaging and Bel-More Laboratories where the intermediates are mixed under defined conditions to prepare a freeze-dried or liquid form of the Ampligen® drug. Hemispherx is presently negotiating with a major multinational company to expand its manufacturing capability to address a 10% or more market penetration or 50,000 patients in either Europe or the U.S.

The liquid formulation process for Ampligen® was initiated at Cook Imaging, a major U.S.-based facility for preparing large volume parenteral drug products under GMP ("Good Manufacturing Practice"). In October, 1998, the Company started treating ME/CFS patients in the United States with the new ready to use liquid Ampligen® dose format. This liquid process is more efficient and allows for greater volume manufacturing production needed to meet the Company's projected requirements. The product has been very well received in numerous clinical sites throughout the U.S. and Europe. The new process allows the Company to ship ready to use doses directly from the Company's manufacturing/quality assurance facility in Rockville, Maryland to various clinical locations around the country. The ready to use liquid form of Ampligen® is stable and does not require the use of preservatives under refrigerated conditions while preserving full potency.

Ampligen® also has been supplied as an effective means of treatment either as a freeze-dried powder or in a frozen format to the clinical sites where it was stored in a special frost free freezer. In this form, clinical site personnel (nurses/physicians) are required to thaw, heat and cool the frozen product in a water bath just prior to drug administration according to a detailed drug reconstitution protocol. Alternatively, hospital pharmacies are required to combine up to 8 small vials each consisting of 50 mg freeze dried powder into a final dosage unit by use of special sterilized environments including use of a laminar flow hood. The ready to use liquid format of Ampligen® does not require such process. Thus, the availability of the ready to use liquid format of Ampligen® offers multiple conveniences related to storage and administration while reducing the chance of potential mistakes occurring during drug preparation at various locations removed from the Company's manufacturing facility or from hospital facilities with advanced capacity to handle parenteral products, including the availability of laminar flow hoods. The ready to use format has been well received as noted above and there have not been any product recalls in shipments of more than 30,000 doses evidencing a quality manufacturing process and excellent shelf life at the clinical sites.

Bioclones currently produces the majority of the biochemicals for the production of the Company's lyophilized product and completed their first pilot run of liquid doses in 1998. These doses will be used in the ME/CFS Cost Recovery Clinical Treatment Programs as well as the confirmatory Phase III ME/CFS clinical trials. The Company is also actively evaluating new manufacturing locations in Western and Eastern Europe in order to provide similar diversity in Ampligen® product formats (liquid vs. lyophilized) similar to its U.S.-based programs.

Ampligen® Distribution & Marketing

The Company intends to design its marketing strategy to reflect the differing regulations in the health-care systems around the world, and the various marketing and distribution channels that are used to supply pharmaceutical products to those systems.

U.S. Distribution

In the United States, Hemispherx has a contract with Olsten Health Services, a subsidiary of Olsten Corporation (NYSE: OLS), for the specialty distribution and treatment of U.S. patients suffering from CFS. **Olsten Health Services is North America's largest provider of home health and related services.**

The agreement complements Olsten's strategic focus on providing essential marketing, distribution and staffing services to the pharmaceutical and biotechnology industries. The company recently affirmed its commitment to the chronic care community through the development of Chronicare, a new strategic marketing focus which combines infusion, nursing, rehabilitation and disease management to service the special needs of patients with chronic conditions.

Olsten offers Hemispherx unique access to approximately 600 offices staffed with the skilled personnel (including 100,000 care givers), needed for distribution of its new drug therapy. Olsten's health care business services over 400,000 patients/clients each year. Customers include managed care organizations, employers, governmental agencies, hospitals and individuals.

The distribution agreement initially covers only those clinical sites nationwide that treat patients under a cost-recovery protocol approved by the FDA. Olsten will also provide various patient education and support services to assist CFS sufferers in dealing more effectively with this severely debilitating disease.

In strategically using an established service provider with comprehensive expertise in chronic disorders, staffing and a nationwide pharmacy network, Hemispherx will be able to systematically identify CFS patients and distribute Ampligen® in a cost-effective and timely manner to the U.S. market.

Olsten will be responsible for direct marketing activities, physical distribution, billing and collection. This approach avoids high up-front marketing and distribution costs and will help Hemispherx maintain a strong cash flow stream from anticipated sales.

The combined effect of the rapid diagnostic test and Olsten Health Services alliances should allow Hemispherx to build market share rapidly and efficiently.

European and Japanese Distribution

In Europe and Japan, the company plans to adopt a country-by-country and, in certain cases, an indication-by-indication marketing strategy due to the heterogeneity of governmental regulations and alternative distribution systems in these areas.

The company has recently hired two senior executives, Richard Piani and Dr. Cyril de Herdt, to develop their European business. Mr. Piani joins Hemispherx from Rhone-Poulenc where he held the position of a group director and Dr. de Herdt, joined from Pharmacia-Upjohn were he held a senior managements position with responsibility for regulatory affairs.

The Company recently appointed Dr. Evelyn Deschamps, M.D., formerly Medical Director of a major privately held multi-national pharmaceutical company as well as Air France, as its Chief Medical Officer for pan-European operations. Dr. Deschamps is overseeing the Company's significant expansion in staffing and clinical programs in Europe during 1999.

Distribution in other Countries

In South America, the United Kingdom, Ireland, Africa, Australia, Tasmania, New Zealand, and certain other countries and territories, the company is contemplating marketing its products through its relationship with the South African Breweries Ltd. (SAB)/Bioclones. SAB is a $10 billion per year company similar to American Home Products in the U.S. with a truly outstanding management team. We understand the two companies are meeting on a regular basis to ensure a successful product launch and availability of kilo quantities of the drug to meet patient demand in various markets.

Valuation

Revenue: We have developed a model based on assumptions, which in our assessment, are most conservative.

Hemispherx anticipates that the sales price for Ampligen® and related RNA drugs will be in line with current drugs such as interferons used for treatment of hepatitis and will accordingly be fixed at approximately $7,200 for a six month treatment cycle. This price is comparable to the price for Ampligen® in clinical trials where the drug is distributed to patients on a cost recovery basis. Additional cost for patients arise with drug infusion and medical oversight.

The following model assumes Ampligen® approval in either the US or Europe only, each of which has a patient potential of at least 500,000. We also assume only 4% share of patients who will participate in initial treatment within that region. As we have projected in the past, and as analysis in the recent Clayton Dunning Report confirms, at market penetration levels approaching 4% and without accelerated research and development, Hemispherx can achieve operating margins of between 60% and 70% on patented drugs without significant competition.

Therefore, if Ampligen® were used to treat only 4% of either population, Ampligen® would be used by 20,000 persons. At $7,200 for a six month treatment cycle per patient, 20,000 users would produce potential gross annual revenues of $288 million for Hemispherx.

Because about 30% of patients experience a relapse of CFS after initial treatment and need to repeat Ampligen® therapy within 24 months after initial treatment, approx. 80% of patients prefer to receive a 12 month treatment rather than 6 months to significantly decrease the probability of relapse.

These numbers are bases on conservative assumptions because:

- We only assume official approval for Ampligen® in one region; in either Europe or the U.S.
- We only assume 4% of CFS patients enroll in initial Ampligen® treatment. In fact up to 30% of CFS patients are chronically ill and bedridden. As Ampligen® is the only approved drug therapy for this disease the number of patients enrolling in Ampligen® treatment should be much higher.
- A P/E ratio of 20 and a profit margin of 60% are conservative estimates for a company with the only officially approved drug for such a debilitating disease like CFS.
- A new diagnostic test has been developed which identifies CFS sufferers one to three years in advance of physicians' current ability to diagnose CFS which can rapidly expand the patient market.
- The market potential for Ampligen® and Hemispherx RNA based technology for developing treatment applications in other disease like AIDS, Hepatitis B/C, malignant melanoma, etc. is with no means taken into account in this Valuation model.

Annuity Value realization

It is important to point out, that once Ampligen® gets official approval for CFS treatment, it can also be prescribed for other disease, as official approval for a drug is not necessarily linked to the prescription for one single disease.

A key factor to unlock Hemispherx revenue potential is the response by managed care entities in the reimbursement for Ampligen® therapy. CFS patients already drain massive resources from health care providers, as many patients are bedridden and require extensive medical care or even full hospitalization.

Financials

Income Statement

	December 31,		
	1996	1997	1998
Revenues:			
Research and development	$32,044	$258,715	$400,708
Total revenues	$32,044	$258,715	$400,708
Costs and expenses:			
Research and development	$1,902,327	$4,562,258	$4,562,258
General and administrative	$3,023,590	$2,194,945	$2,957,831
Preferred stock conversion expense		$1,200,000	
Consulting stock compensation expense	$62,523	$62,523	$794,797
Total cost and expenses	$4,925,917	$6,632,866	$8,314,886
Interest and other income	$339,384	$267,291	$590,085
Net loss	$(-4,554,489)	$(-610,686)	$(-7,324,093)
Basic loss per share	$(-0,29)	$(-0,35)	$(-0,32)
Weighted average shares outstanding	15,708,136	$17,275,994	22,724,913

Glossary

Product, compound or technical term	Description and / or use
Adverse effects	Unwanted or undesirable effects resulting from drug treatment.
Biochemical	The chemical compounds and their reactions occurring in living organs.
Antisense	Oligonucleoside sequence (antisense) used to selectively block mRNA and synthesis of disease causing proteins inside cells.
Antisense theraphy	The use of short DNA-like molecules to inhibit the expression of a gene whose product is pathogenic. The inhibition is based upon the physical binding of the molecules to the gene, or other nucleic acid, that encodes the protein.
Biotechnology	Chemical compounds formed by a living organism.
Biotechnology drugs	Developed from techniques for the application of biological processes to production of materials for use in medicine. Usually these are large naturally occurring peptides such as insulin, human growth hormones or erypthropoetin.
Cancer	A general term for the rapid growth of abnormal cells, which may invade surrounding tissues or metastasize to other organs or parts of the body and eventually result in death if left untreated.
Carcinoma	A type of cancer that starts in the skin or the living of organs.
Chronic fatigue syndrome	A condition generally characterized by a debilitating fatigue, persistent for more then six months and more than 50% of each day and is unresolved by rest. Other symptoms may vary.
Clinical trial	A controlled study of a drug candidate's action in humans.
CMV	Cytomegalovirus. A virus of largely unknown pathogenicity present in the majority of individuals.
Cognitive function	The function of the brain by which we become aware of objects of thoughts of perception including all aspects of perceiving, thinking and remembering.
Combinational therapy	The use of more than one drug treatment.
Defined group of patients	A group of patients in which clear determination of the limits has been described, often as in clinical entry criteria, minimizing variability within the group.
Drug	A substance administered to a living organism with the intention of preventing, curing or suppressing disease.
Drug resistance	The result of cells' ability to resist the effects of a specific drug. Often seen in the treatment of cancer.
Effectiveness	The ability of an intervention to produce the desired benefitial effect in actual use, in the hands of practicing physicians under routine conditions.
Endpoints	The outcomes measured during a study. The endpoint should be defined before the clinical study starts. There may be primary endpoints and secondary endpoints. The former is the critical measurement and usually defines efficacy, while the latter often describes the presence and rate of side effects.

Description and / or use	Product, compound or technical term
The Food and Drug Administration of the United States, responsible for regulating the approval, licensing and manufacturing of drugs.	FDA
A common disease of the liver (estimated 350 million cases worldwide) as a result of a viral infection. Spread principally by blood and sexual routes.	Hepatitis B
The virus that causes AIDS.	Human immunodeficancy virus (HIV)
Natural defense against harmful invaders of the body. A substance recognized as foreign activities certain cells to manufacture antibodies, which are specific for the invader and enable it to be removed or destroyed.	Immune system
Investigational new drug certificate, issued by the FDA, allowing clinical trials to be conducted on patients in the United States.	IND
To introduce a solution into the body through a vein.	Infuse
The slow drop-by-drop introduction of a fluid direct into the bloodstream ('drip').	Infusion
A naturally produced chemical released by the body in response to viral infections. Interferon can be artificially produced and used as a form of immunotheraphy.	Interferon
Having the potential to invasive, destructive and fatal; usually in the context of cancer. Also used in context of rapidity rising, uncontrolled hypertension.	Malignant
A tumor made up of cancer cells of a type that can spread to other parts of the body.	Malignant tumor
A method of delivering and paying for health care through a system of networks of providers. Managed care seeks to ensure the quality and contain the cost of comprehensive medical care. Managed-care plans include HMOs, preferred provider organizations, point-of-service plans, and similar coordinated care networks.	Managed-care
A cancer of the pigment-forming cells of the skin or the retina as pellets for extrusion or moduling.	Melanoma
Treatment with a single drug. For example, epalipsy is usually treated first with monotheraphy, with further drugs added if seizures are not controlled (see Polytheraphy).	Monotheraphy
Large biological polymers that store genetic information and mediate its transferral into protein synthesis. DNA and RNA are nucleic acids.	Nucleic acid
Clinical trials that are not blinded to the investigators, such that the clinical trial investigators know which groups of patients are receiving the drug and which groups are receiving placebo or other drugs.	Open label
A drug entity of limited commercial potential for which the US FDA has declared financial incentives to aid in its development. The current incentive is a seven year exclusive approval.	Orphan drug
Status granted by the FDA, which provides certain development, registration and marketing incentives, for the development of treatments for small (under 200,000 per annum in the US) incidence conditions.	Orphan drug status

Product, compound or technical term	Description and / or useProduct, compound or technical term
Phase I	The assessment of a biologically-active substance, usually in volunteers, to investigate safety.
Phase IIa	Studies in a limited number of patients to make a preliminary determination of efficacy to provide proof of the concept.
Phase II	The assessment in patients of a drug to determine dosè and preliminary efficacy.
Phase IIb	Studies in a larger number of patients to determine the range of doses to be used in Phase III clinical trials.
Phase III	Definitive studies to evaluate a new treatment for safety and efficacy in patients who are likely to benefit. These trials are used to find out as much as possible about the new drug; for example, its effectiveness and its side effects.
Phase IV	Clinical trials performed after marketing authorization designed to monitor drug use in the clinical setting; and to extend uses.
Placebo	A dummy medication or treatment. Placebos are medicinal preparations witohout specific pharmacological activity against a targeted condition and are often administered to control groups in clinical trials to provide baseline measurements for the experimental protocol.
Polytherapy	Treatment with more then one drug.
®	Denotes a trademark registered in the United States.
Relapse	The reappearance of a disease after its apparent cessation.
Renal	Pertaining to the kidneys.
Rheumatoid arthritis (RA)	Common azuto-immune disease marked by chronic progressive destruction of joint tissues.
Ribonucleose	An enzyme that can cleave the phospodiester bonds of RNA.
Ribonucleic acid (RNA)	A single stranded molecule that serves primarily to relay information from the DNA in the nucleus of a cell to the cytoplasm where it is translated by ribosomes into proteins via messenger RNA (mRNA). Chemically RNA differs from DNA by the presence of an oxygen atom and the use of the base uracil instead of thymine. Other classes of RNA included ribosomes (rRNA) and transfer (tRNA) that serve to join the appropriate amino acids together on the mRNA template to form proteins.
RNA polymerase	An enzyme that catalyses the formation of RNA from ribonucleoside triphosphates, using DNA as a template.
Treatment IND	FDA's treatment IND regulations offer a mechanism that allows drug developers to provide earlier and wider access to investigational therapies for patients with immediately life-threatening or otherwise serious diseases for which there is no satisfactory alternative drug treatment. A treatment IND permits this expanded use while further data are developed during the clinical investigation of the drug that precedes the submission of a marketing application.
Uclerative colitis	Chronic inflammatory condition of the colon, linked with western lifetsyles.