Initiation
Overweight

MACK, MACK US
Price: $7.50

Price Target: $10.00

Merrimack Pharmaceuticals

Initiating at Overweight; Broad, Validated Oncology Pipeline Led by MM-398

We are initiating coverage of Merrimack Pharma (MACK) with an Overweight rating and $10 Dec 2012 target. Merrimack's proprietary Network Biology Platform has the potential to dramatically improve the productivity of drug discovery/development in oncology. Indeed, the company has a robust pipeline (5 clinical, 3 preclinical assets) with multiple opportunities across a variety of cancers. Lead asset MM-398 is a nanotherapeutic in phase 3 development for pancreatic cancer with data in mid-2013. In our view, MM-398 could be a $900M peak opportunity in the US alone given the unmet medical need. Additionally, MM-121, partnered with Sanofi, is currently in phase 2 trials for NSCLC, breast and ovarian cancer (data 2013-14) with peak sales potential of $1.3B in the US alone (driving royalties of ~$320M). Importantly, we believe Merrimack's Network Biology Platform has been validated by the recent phase 1 data for MM-121 and MM-111 and to some extent the Sanofi partnership. Despite a broad pipeline, our $10 PT is supported primarily by MM-398 and to a lesser extent MM-121 and MM-111 (US sales only); hence, we see multiple value creation opportunities with de-risking clinical events over the course of 2012-13.

- **Key value driver is MM-398 in pancreatic cancer.** In a phase 2 trial, MM-398 demonstrated an encouraging 5.6-month overall survival (OS), well ahead of what is normally seen. We expect a similar outcome in the phase 3 NAPOLI-1 trial in mid-2013, which could put MM-398 as the standard of care in second-line metastatic pancreatic cancer. Indeed, feedback from physicians has been positive with broad expectations for first-line use in pancreatic cancer.

- **MM-121 and MM-111 validated.** These agents both target the ErbB3 pathway in cancer (MM-111 specific for HER2+ disease), the importance of which was pioneered by Merrimack. Recently, this target was validated by positive phase 1 data from both agents. Specifically, robust response rates were demonstrated in 87 patients from a wide variety of cancer types, even in a difficult-to-treat, heavily-pretreated population. Although this activity needs to be confirmed in controlled, larger phase 2 and 3 studies, we believe the phase 1 data have clearly de-risked the mechanism and shows promise for '111 and '121.

- **Overweight rated; $10 Dec 2012 PT:** Our NPV analysis conservatively includes only US sales of MM-398 (70% POS), MM-121 (50% POS) and MM-111 (30% POS) with multiple opportunities for value creation from clinical trial de-risking in the next 12-24 months.

US Biotechnology

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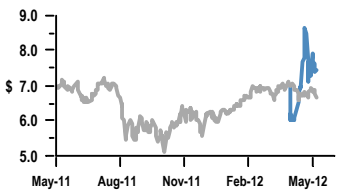
Price Performance



	YTD	1m	3m	12m
Abs	6.6%	24.1%	6.6%	6.6%
Rel	-0.3%	27.6%	11.3%	11.5%

Merrimack Pharmaceuticals (MACK;MACK US)

FYE Dec	2010A	2011A	2012E	2013E	2014E
EPS Reported ($)					
Q1 (Mar)	-	-	(0.18)	-	-
Q2 (Jun)	-	-	(0.21)	-	-
Q3 (Sep)	-	-	(0.24)	-	-
Q4 (Dec)	-	-	(0.25)	-	-
FY	(5.57)	(7.67)	(0.88)	(1.04)	(0.47)

Source: Company data, Bloomberg, J.P. Morgan estimates.

Company Data	
Price ($)	7.50
Date Of Price	07-May-12
52-week Range ($)	9.00 - 5.81
Mkt Cap ($ mn)	862.84
Fiscal Year End	Dec
Shares O/S (mn)	115
Price Target ($)	10.00
Price Target End Date	31 Dec 12

See page 30 for analyst certification and important disclosures.

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Investment Thesis

Merrimack Pharmaceuticals (MACK)

Overweight

Proprietary Network Biology Approach to Drug Discovery

Network Biology is an interdisciplinary approach to the study of complex biological systems. This approach integrates various scientific disciplines and provides a broader understanding of cell signaling pathways. Employing this analysis, signaling networks involved in disease can be identified and modeled. This approach can be utilized throughout the drug development process including target identification, lead compound design/optimization, diagnostic discovery and clinical trial design. Indeed, Network Biology led Merrimack to identify the importance of the ErbB3 pathway, an area of development the company has pioneered (MM-121 and MM-111). Importantly, this pathway has been validated by recent phase 1 data. Although we do not attribute any value, we believe Network Biology has the potential to improve efficiency and productivity in the drug development process.

MM-398: A Better Irinotecan; Key Value Driver

MM-398 is currently in a phase 3 trial called NAPOLI-1 for second-line metastatic pancreatic cancer with data expected in mid-2013. MM-398 is a nanotherapeutic encapsulation of irinotecan (marketed chemotherapy). In a phase 2 single-arm study, MM-398 demonstrated an encouraging 5.6-month OS with a safety profile comparable to that of irinotecan despite higher tumor exposure. Currently, there is no standard of care for second-line metastatic pancreatic cancer, and we believe MM-398 can fill this need. Feedback from physicians has been very positive, highlighting the advantage of tissue penetration and the potential for MM-398 to be used first-line in combination with gemcitabine the current standard of care. We believe MM-398 has the potential to replace irinotecan not only in pancreatic cancer, but in many other cancers as well, such as, colorectal cancer (CRC). We project peak sales of $900M in the US alone given the unmet medical need in this population.

MM-121: Blockbuster Opportunity; Partnered with Sanofi

MM-121 is currently in phase 2 trials in multiple tumors (NSCLC, breast cancer and ovarian cancer) with multiple data sets expected in 2013 and 2014. MM-121 is a fully human monoclonal antibody targeting ErbB3. MM-121 is being developed in combination with other chemotherapies and targeted agents. Importantly, MM-121 has the potential to both restore tumor sensitivity and delay the development of resistance. Recent, positive phase 1 data across a variety of tumor types and the partnership with Sanofi validated this approach, in our view. Although this program is still in early development, we believe MM-121 has potential in multiple tumors. We forecast peak sales of $1.3B in the US alone with Merrimack receiving $320M in royalties assuming the company opts into US co-promotion.

MM-111: Niche Opportunity in HER2+ Tumors

MM-111 is expected to enter phase 2 testing in 2012. MM-111 is a bi-specific antibody (targets both the ErbB2 and ErbB3) for HER2+ tumors. MM-111 is also being developed in combination with other chemotherapies and targeted agents and similarly has the potential to restore tumor sensitivity and delay resistance. Phase 1 data of MM-111 in combination with other therapies across multiple HER2+ tumor types (breast cancer, bladder cancer, esophageal cancer, colon cancer and ovarian cancer) have been encouraging, providing additional validation for targeting ErbB3. Although this program is still in early development, we believe MM-111 has

potential in multiple HER2+ positive tumors. We conservatively forecast peak sales of $550M in the US alone.

Deep Pipeline with Multiple Opportunities

By leveraging a proprietary Network Biology approach, Merrimack has developed a robust pipeline with multiple assets in various stages of clinical development. Beyond the later-stage agents detailed above (MM-398, MM-121 and MM-111), multiple candidates are in phase 1 trials (MM-302 and MM-151) and in preclinical testing (MM-141, MM-310 and MM-131) in a variety of cancers. We believe this pipeline provides multiple opportunities for success.

Risks to Rating and Price Target

Clinical risk

Predicting the outcome of late-stage clinical trials is very difficult. As such, MM-398, currently in a phase 3 NAPOLI-1 trial for pancreatic cancer, may fail to demonstrate a similar outcome to its phase 2 study. Thus, MM-398's ability to demonstrate a meaningful benefit in pancreatic cancer is critical to MACK shares and a key source of clinical risk. Another source of clinical risk is MM-121 in phase 2 clinical trials for NSCLC, breast and ovarian cancer.

Regulatory risk

Assuming MM-398 is successful in phase 3 trials in pancreatic cancer, the next step would be regulatory approval. Even if MM-398 demonstrates a clinical benefit, there is no guarantee that regulators will approve the drug. We see similar risks for MM-121 and MM-111. Thus, MM-398, MM-121 and MM-111 could face difficulties obtaining approval from the FDA or EMEA.

Commercial risk

Merrimack has no marketed products. For MM-389 and other pipeline agents (except MM-121), the company intends to market these products on its own. However, Merrimack, has no experience marketing drugs, which could prove challenging. For MM-121, we assume the company opts into a US co-promote with partner Sanofi. Despite potential advantages, MM-389, MM-121 and MM-111could fail to gain a meaningful market share.

Financial risk

Following completion of its initial public offering, we estimate Merrimack has approximately $157M in cash on hand. However, with advancement of a broad pipeline and product revenues not expected until 2014, the company may need to raise additional capital, which could dilute current shareholders.

Legal risk

Overall, Merrimack has a broad intellectual property estate on its pipeline products consisting of both wholly owned (issued and pending) and licensed patents. Failure of pending patents to be issued or an inability to defend existing patents in the US or Europe could substantially limit the commercial opportunities.

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Overview

Company Description

Based in Cambridge, MA, Merrimack is a developmental stage biopharmaceutical company focused on discovering therapeutics to treat serious diseases, initially targeting cancers. Through a better understanding of various disease processes, the company intends to develop more precise therapeutics with companion diagnostics. To meet this goal, the company is employing a propriety systems biology-based approach to biomedical research, called Network Biology. The company currently has no marketed products, but has 5 oncology candidates in clinical development. The most advanced is MM-398, currently in a phase 3 trial for pancreatic cancer, followed by MM-121 in phase 2 and MM-111 expected to enter phase 2 in 2012.

Background

Merrimack was founded in 1993 under the name Immtek. In 1995, the name was changed to Atlantic Bio Pharmaceuticals. Later in 2001, after the acquisition of Merrimack Pharmaceuticals, the company's name was again changed to Merrimack Pharmaceuticals. On March 28, 2012, Merrimack completed its IPO (J.P. Morgan acted as sole book running manager of the offering).

Network Biology is an interdisciplinary approach to the study of complex biological systems. This approach integrates various scientific disciplines such as biology, simulation and mathematics to provide scientists with a broader understanding of cell signaling pathways. Through this analysis, signaling networks involved in disease states can be identified and modeled. These models can then be used in the drug development process with the potential to improve both efficiency and productivity. Indeed, Network Biology can be utilized through out the development process including target identification, lead compound design/optimization, diagnostic discovery and clinical trial design.

Pipeline

Currently Merrimack has no market products. However, the pipeline is robust with multiple assets in various stages of clinical development (Table 1). MM-398 is the most advanced currently in a phase 3 trial called NAPOLI-1 for pancreatic cancer, a phase 2 in colorectal cancer (CRC) and a phase 1 in glioma. The next most advanced asset, partnered with Sanofi, is MM-121 in multiple phase 2 trials (breast cancer, NSCLC, and ovarian) as well as multiple phase 1 trials in solid tumors. Multiple candidates are in phase 1 trials (MM-111, MM-302 and MM-151) and in preclinical testing (MM-141, MM-310 and MM-131).

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Table 1: Merrimack Pipeline Overview

Product	Indication	Target	Preclinical	Ph I	Ph II	Ph III	NDA	Marketed
MM-398	Pancreatic Cancer (2nd line)	Nanotherapeutic (encapsulated irinotecan)						
	Colorectal Cancer							
	Glioma							
MM-121*	Breast Cancer	Monoclonal antibody (ErbB3)						
	NSCLC							
	Ovarian Cancer							
	Solid tumors							
MM-111	ErbB+ Cancers	Bispecific antibody (ErbB3 & ErbB2)						
MM-302	ErbB2+ Cancers	Antibody targeted nanotherapeutic (ErbB2 targeted encapsulated doxorubicin)						
MM-151	Solid Tumors	Oligoclonal antibody (EGFR)						
MM-141	Cancer	Bispecific tetravalent antibody (IGF-1R & ErbB3)						
MM-310	Cancer	Undisclosed						
MM-131	Cancer	Undisclosed						

Note: * indicates program is partnered with Sanofi

Source: Company reports.

Catalysts and Milestones

MM-398

MM-398 is a novel, nanotherapeutic encapsulation of irinotecan (marketed chemotherapy). In a phase 2 trial in pancreatic cancer, MM-398 met the primary endpoint, achieving a median OS of 5.6 months. This supported the initiation of a phase 3 trial called NAPOLI-1 with data expected in mid-2013 (Table 2). In July 2011, MM-398 was granted orphan status by the FDA in pancreatic cancer and two months later (September) received orphan designation from the EMEA. MM-398 would represent Merrimack's first marketed product, and we anticipate approval in 1H14.

MM-398 also met the primary endpoint in a phase 2 gastric cancer study. Data from a phase 2 trial in colorectal cancer (CRC) is expected in mid-2013. MM-398 also has potential in a number of other cancers (lung cancer, glioma, etc.). Additionally, Merrimack owns the worldwide rights to MM-398 except in Taiwan.

MM-121

MM-121 is a monoclonal antibody, developed using Merrimack's Network Biology approach that targets ErbB3 (or HER3). MM-121 is in multiple phase 2 trials both in combination with chemotherapies and other targeted agents across different types of cancers with data in 2013 and 2014 (Table 2). Data in breast cancer (ER/PR+) is expected in 1H13, with data in non-small cell lung cancer (NSCLC) in 1H13. Data

from the ongoing phase 2 trials in neo-adjuvant breast cancer and ovarian cancer are expected in 2H13 and 1H14, respectively.

In September 2009, Merrimack entered into a worldwide collaboration with Sanofi on MM-121. At the time, MM-121 was already in phase 1 testing. Under the agreement, Sanofi is responsible for all developmental and manufacturing costs. In return, Merrimack received an upfront payment of $60M and is entitled to clinical, regulatory and sales milestones of up to $470M as well as tiered royalties on worldwide sales. However, Merrimack has the right to co-promote MM-121 in the US.

MM-111

MM-111 is a bi-specific antibody, also developed using Merrimack's Network Biology, that targets both ErbB2 (or HER2) and ErbB3 (or HER3). The agent has potential applications in a number of HER2+ solid tumors (breast, lung, ovarian, etc.). MM-111 is currently in a multi-arm combination (MAC) phase 1 trial with updated data expected in 2H12 (Table 2). Initiation of phase 2 trials in HER2+ tumors is expected in 2012.

MM-302

MM-302 is a nanotherapeutic encapsulation of doxorubicin (marketed chemotherapy) with an attached antibody that targets ErbB2 (or HER2). Data from a phase 1 trial are expected in 2H12, with initiation of a phase 2 trial in advanced HER2+ breast cancer anticipated in 1H13 (Table 2).

MM-151

MM-151 is an oligoclonal therapeutic (mixture of 3 antibodies) that targets different non-overlapping portions of the epidermal growth factor receptor (EGFR or ErbB1). MM-151 is currently in a phase 1 trial in solid tumors with data expected in 1H13 (Table 2). A phase 2 trial is expected to begin in 2H13.

Preclinical Assets

Multiple assets targeting cancer are currently in preclinical testing. These include MM-141 (bi-specific tetravalent antibody), MM-310 (antibody targeted nanotherapeutic) and MM-131 (multispecific antibody), which are expected to begin phase 1 trials in 2H12, 1H13 and 2H13, respectively.

Table 2: Merrimack Clinical Catalysts (2012 to 2014)

Est Timing	Drug	Indication	Event	Significance
Mid12	MM-121	NSCLC	Phase 1 data MM-121 + Erlotnib (ASCO)	Medium
2H12	**MM-121**	**Breast and Ovarian Cancer**	**Updated phase 1 data of MM-121 + paclitaxel (ESMO, Sept 28- Oct 2)**	**Medium**
2H12	MM-302	HER2 + cancer	Phase 1 data monotherapy	Low
2H12	MM-111	HER2 + cancer	Updated phase 1 data multiple combinations (SABC, Dec 4-8)	Medium
1H13	**MM-121**	**Breast Cancer**	**Phase 2 data MM-121 + exemestane vs. exemestane in ER/PR+ BC**	**High**
1H13	MM-151	Cancer	Phase 1 data	Low
1H13	MM-121	NSCLC	Phase 2 data MM-121 + erlotnib vs. erlotnib in wide type EGFR and mutant EGFR resistant to erlotnib	High
1H13	MM-121	NSCLC	Phase 2 data MM-121 + erlotnib in mutant EGFR resistant to erlotnib	High
Mid13	**MM-398**	**Pancreatic Cancer**	**Phase 3 NAPOLI-1 data MM-398 vs. 5FU + LV**	**High**
Mid13	MM-398	CRC	Phase 2 data FUPEP (MM-398 + 5FU + LV) vs. FOLFIRI (5FU + LV + irinotecan)	High
2H13	MM-121	Ovarian Cancer	Complete enrollment in Phase 2 MM-121 + paclitaxel vs. paclitaxel	Low
2H13	**MM-121**	**Breast Cancer**	**Phase 2 data MM-121 + paclitaxel vs. paclitaxel in neoadjuvant hormone sensitive BC**	**High**
1H14	MM-121	NSCLC	Phase 2 data MM-121 + erlotnib vs. erlotnib in mutant EGFR erlotnib naïve	High
1H14	MM-121	Breast Cancer	Phase 2 data MM-121 + paclitaxel vs. paclitaxel in neoadjuvant triple negative BC	High

Source: J.P. Morgan estimates and Company data.

What Is Network Biology?

Network Biology is an interdisciplinary approach to the study of complex biological systems. This approach integrates various scientific disciplines such as biology, simulation and mathematics to provide scientists with a broader understanding of cell signaling pathways. Through this analysis, signaling networks involved in disease states can be identified, referred to as "Critical Network Identification." In cancer, these critical networks typically involve cell growth and survival pathways. Following identification, each signaling network undergoes mapping and measuring to support the construction of a detailed biochemical model. These models are then tested through experimentation to improve accuracy. Once validated, these complex models can then be used for drug discovery.

Traditionally, drug discovery has taken a simplistic approach with a focus on individual molecules. However, Network Biology goes much deeper accounting for the higher level of complexity that governs cell signaling and thus cell behavior. Specifically, Network Biology focuses on multiple molecules rather than just one. Additionally, multiple interactions are considered in an attempt to capture the signaling complexities as there are many positive and negative feedback loops that together determine call behavior. Finally, this method is multidimensional and takes into account the dynamic nature of cellular signaling including not only signal intensity but also duration, which impacts cell behavior.

Network Biology offers some advantages over the traditional drug discovery method. A more detailed understanding provides the opportunity to develop targeted therapeutics that address the specific cause of the underlying disease. Additionally, there may be multiple causes of a single disease that allow for the development of multiple therapies. Furthermore, patients can be stratified based on their underlying disease with the use of companion diagnostics. These diagnostics can then be used to guide therapy, linking patients with the right treatment. Taken together, these

advantages have the potential to both increase the efficiency and productivity of the drug development process.

Intellectual Property

As of February 29, 2012, in the US, Europe and other jurisdictions, the company owned 17, 2 and 12 issued patents, respectively. In addition to these, the company also has as of that date 28 pending provisional and non-provisional patent applications in the US and 160 pending patent applications in Europe and 42 other jurisdictions. The company has also licensed 37 US patents and 8 pending applications as well as foreign counterparts to many of these patents and patent applications; the majority are licensed on an exclusive basis.

MM-398

For MM-398, the patent portfolio is wholly owned by Merrimack. As of February 29, 2012, this portfolio included two pending US patent applications. One of these patents applications covers composition of matter (allowed February 1), which would not expire before July 2027 taking into account the then estimated patent term adjustment. The other pending US patent covers methods of use and would expire in 2025 if issued. With respect to Europe and other countries, there are pending patent applications that, if issued, would expire in 2025 (Table 3).

MM-121

The patent portfolio for MM-121 consists of wholly owned, co-owned and licensed patents and patent applications. In the wholly owned category there is a US composition of matter patent that expires in 2028. Related patent applications are pending in the US and Europe that, if issued, would also expire in 2028. Method of use and diagnostic patent applications are also pending in the US and Europe that would expire in 2029 and 2031. Additionally, the portfolio included four pending provisional patent applications that are eligible for worldwide filing and could be used to establish non-provisional patent applications that, if issued, would expire in 2032-33 (Table 3).

In addition to these, Merrimack has eleven pending provisional patent applications, co-owned with Sanofi, which are eligible for worldwide filing and could be used to establish non-provisional patent applications that would expire in 2032 and 2033 if issued. The company also has a non-exclusive license from the US Public Health Services, to a family of US patents that broadly cover anti-ErbB3 antibodies, expiring in 2016.

MM-111

For MM-111, the patent portfolio is a mix of both wholly owned and licensed patents. Wholly owned patent applications include two pending US patent applications that cover composition of matter and methods of use that would expire in 2029 if issued. Additionally, one provisional patent application is pending that could be used to establish a non-provisional patent applicaiton extending protection to 2032. One related patent application is pending in Europe that, if issued, would expire in 2029 (Table 3).

Several patents and patent applications are also licensed from Regents. This includes an exclusive license to a family of patents including issued composition of matter patents in the US and Europe that expire in 2023. The company also has a non-exclusive license on a family of patents the last of which will expire in 2016.

Table 3: Key Product Patents

Product		US: Issued or allowed	US: Pending	Europe
MM-398	**Wholly Owned**	Composition of matter patent application that, as of February 29th, 2012, if issued, was estimated to expire in 2027 (allowed Feb 1, 2012)	Methods patent application that, if issued, would expire in 2025	Pending patent application that, if issued, will expire in 2025
MM-121	**Wholly Owned**	Composition of matter patent that expires in 2028	Four composition of matter, method of use and diagnostic patent applications that would expire in 2028-2029, and four provisional patent applications that could be used to establish non-provisional patent applications that would expire in 2032-2033.	Pending patent applications that would expire in 2028 and 2029.
	Co-Owned	N/A	11 pending provisional patent applications co-owned with Sanofi that are eligible for world-wide filing and, if issued, would expire in 2032 and 2033.	N/A
	Licensed	A family of patents, the last of which will expire in 2016	N/A	N/A
MM-111	**Wholly Owned**	N/A	Two composition of matter, methods of use, and diagnostic patent applications that, if issued, will expire in 2029, and one provisional patent application that could be used to establish a non-provisional patent application that would, if issued expire in 2032.	19 pending patent application that, if issud, would expire in 2028-2029 in Europe and other countries
	Licensed	Exclusive license to a composition of matter/method of use patent that will expire in 2023.	N/A	Non-exclusive license to an issued composition of matter patent and a pending divisional application that will each expire in 2016; Exclusive license to an issued composition of matter patent and a pending divisional application that, if issued, would each expire in 2023
MM-302	**Wholly-Owned**	N/A	One provisional patent application that could be used to establish a non-provisional application that, if issued, would expire in 2031.	N/A
	Licensed	Exclusive license to 5 composition of matter patents that expire between 2014-2019; one method of use patent that expires in 2019, and one composition of matter patent application that has been allowed and, if issued, should expire in 2017	N/A	Exclusive license to two composition patents that expire in 2014 and 2019 as well as 1 composition/method patent that expires in 2019.
MM-151	**Wholly Owned**	N/A	Three composition of matter, method of use, and diagnostic provisional patent applications that may be used to establish non-provisional patent applications that would, if issued, expire in 2032, and one composition of matter/method of use patent application that, if issued, will expire in 2031.	N/A

Source: Company reports.

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MM-398

MM-398 is currently in a phase 3 trial called NAPOLI-1 for second-line metastatic pancreatic cancer with data expected in mid-2013. MM-398 is a nanotherapeutic encapsulation of irinotecan (a marketed chemotherapy). In a phase 2 single-arm study, MM-398 demonstrated an encouraging 5.6-month OS with a safety profile comparable to that of irinotecan despite higher exposure. Currently there is no standard of care for second-line metastatic pancreatic cancer, and we believe MM-398 can fill this need. Additionally, we believe MM-398 has the potential to replace irinotecan not only in pancreatic cancer, but many other cancers as well such as CRC. We project peak sales of $900M in the US only based on the unmet medical need.

A Brief Review of Pancreatic Cancer Treatment

Gemcitabine has been the standard of care for the first-line treatment of metastatic pancreatic cancer since 1997.[1] Studies evaluating the addition of other agents (cytotoxic and targeted) to gemcitabine have not resulted in significant survival advantages relative to gemcitabine alone. Recently, a phase 3 trial in first-line metastatic pancreatic cancer with FOLFIRINOX (oxaliplatin, irinotecan, 5-FU and LV) demonstrated significant improvements in ORR (31.6% vs. 9.4%, $p<0.001$) and OS (11.1 mo vs. 6.8 mo, $p<0.001$) compared to gemcitabine alone.[2] However, FOLFIRINOX was significantly more toxic relative to gemcitabine (greater grade 3/4 neutropenia, thrombocytopenia, diarrhea and sensory neuropathy). As such, FOLFIRINOX may provide another first-line option for a select group of patients with good performance status.

Despite clarity on first-line treatment, there remains no consensus on treatment of second-line gemcitabine refractory metastatic pancreatic cancer.[3] These patients are generally treated with a combination of the following chemotherapies including gemcitabine, capecitabine, oxaliplatin, 5-FU and LV. We believe the lack of consensus in this patient population provides an opportunity for MM-398.

Mechanism of Action

MM-398 is a nanotherapeutic encapsulation of irinotecan, a currently marketed chemotherapy. Irinotecan is a prodrug that is typically metabolized by the liver into active SN-38, which inhibits topoisomerase 1, an enzyme that plays a role in cell replication. Thus, SN-38 circulates throughout the body and indiscriminately inhibits cell growth. This is the hallmark of chemotherapies, leading to severe side effects that limit the effectiveness of these potent agents.

Nanotherapeutic encapsulation offers potential advantages that could increase efficacy and reduce toxicity compared with free irinotecan. This approach prevents the premature metabolism of the active drug, limiting systemic exposure. MM-398 was also designed (size and stability) to take advantage of the enhanced permeability and retention (EPR) of leaky vasculature associated with tumors. As such, MM-398 is preferentially deposited in tumors rather than normal tissue. Once in the tumor,

[1] Burris *et. al.* , *J Clin Oncol* 1997, 15: 2403-13
[2] Conroy *et. al. NEJM* 2011, 364: 1817-25
[3] Gounaris *et. al. JOP* 2012; 11(2): 113-23

local macrophages break down MM-398 into active SN-38. Hence, the active agent is delivered directly to the site of the tumor.

In conjunction with development of MM-398, the company is also developing a companion diagnostic. A nanotherapeutic formulation (DX-929) of an imaging agent for PET scans is currently being investigated in preclinical studies. This diagnostic could help measure the level of deposition in the tumor. As such, patients that are most likely to respond to MM-398 could be identified. The company expects to enter clinical testing by YE12.

Phase 3 Trial in Pancreatic Cancer Ongoing

A phase 3 trial of MM-398 in metastatic pancreatic cancer patients that have previously failed gemcitabine (second-line) is currently ongoing (Table 4). The study is comparing MM-398 (120mg/m^2) with 5 Flurouracil (5-FU, 2000mg/m2) + Leucovorin (LV, 200 mg/m2). The target enrollment is 270 patients from 90 sites in the US, Europe, Africa and Asia. The primary endpoint is overall survival (OS). Secondary endpoints include objective response rates (ORR), progression free survival (PFS) and time to treatment failure.

Table 4: Phase 3 NAPOLI-1 Trial Design

	NAPOLI-1
n	270
Inclusion Criteria	Histological or cytologically confirmed adenocarcinoma of the exocrine pancreas Metastatic disease Documented disease progression after prior gemcitabine therapy KPS ≥ 70 Adequate bone marrow, hepatic and renal function
Dosing	**Experimental:** MM-398 120mg/m^2 IV Q3W **Active Comparator:** 5 Flurouracil 2000 mg/m^2 IV + Leucovorin 200 mg/m^2 IV for 4 wks followed by 2 wks of rest every 6wks
Duration	24 months
Primary Endpoint	Overall Survival (OS)
Secondary Endpoints	Progression Free Survival (PFS) Time to Treatment Failure Objective Response Rate (ORR)
Status **Start** **Data Expected**	 November 2011 Mid 2013

Source: Clinicaltrials.gov

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Review of Phase 2 Data for MM-398 in Pancreatic Cancer

A phase 2 (n=40) single-arm study evaluated MM-398 in metastatic pancreatic cancer patients that failed gemcitabine. In this study, MM-398 was dosed at 120 mg/m^2 every three weeks (Q3W). The study was conducted in the US (University of California San Francisco) and Taiwan.

The study met the primary endpoint with 75% of patients surviving 3 months or longer (Table 5). The cut off for success was 65% considering that only 40% of these patients are expected to survive for 3 months without any therapy. Additionally, treatment with MM-398 resulted in a 7.5% ORR (3 patients achieving a PR), a median PFS of 9.6 weeks and median OS of 22.4 weeks.

Table 5: Phase 2 MM-398 Efficacy Data in Pancreatic Cancer

<table>
<tr><th colspan="5">Survival</th></tr>
<tr><td colspan="2">Median PFS</td><td colspan="3">Median survival</td></tr>
<tr><td colspan="2">9.6 weeks</td><td colspan="3">22.4 weeks</td></tr>
<tr><td>3-month</td><td colspan="2">6-month</td><td colspan="2">1-year</td></tr>
<tr><td>75%</td><td colspan="2">42.5%</td><td colspan="2">25%</td></tr>
<tr><th colspan="5">Best Tumor Response</th></tr>
<tr><td>PR</td><td>Minor response (shrinkage >10%)</td><td>SD</td><td>PD</td><td>Not evaluable</td></tr>
<tr><td>3 (7.5%)</td><td>8 (20%)</td><td>8 (20%)</td><td rowspan="2">11 (27.5%)</td><td rowspan="2">10 (25%)</td></tr>
<tr><td colspan="3">Disease control</td></tr>
<tr><td colspan="3">19 (47.5%)</td><td colspan="2">Clinical Benefit Response among 25 CBR-evaluable pts</td></tr>
<tr><td colspan="3">CA19-9 Tumor Marker Response (decline > 50%) among 32 pts with elevated baseline</td><td colspan="2">5 (20%)</td></tr>
<tr><td colspan="3">11 (34.4%)</td><td colspan="2"></td></tr>
</table>

Source: ASCO 2011

As of May 31, 2011, 7 patients were still alive, while 2 continued to receive treatment with MM-398 (Figure 1). Additionally, the 6-month and one-year survival rates were 42.5% and 25%, respectively. Given the life expectancy of these advanced pancreatic cancer patients is measured in months, physicians we have spoken to were particularly encouraged by the one-year survival rate of 25%. Of note, in gemcitabine's label, a one-year survival rate of 18% was achieved in first-line metastatic pancreatic cancer. Thus it appears that MM-398 compared favorably with gemcitabine despite a more difficult to treat refractory patient population.

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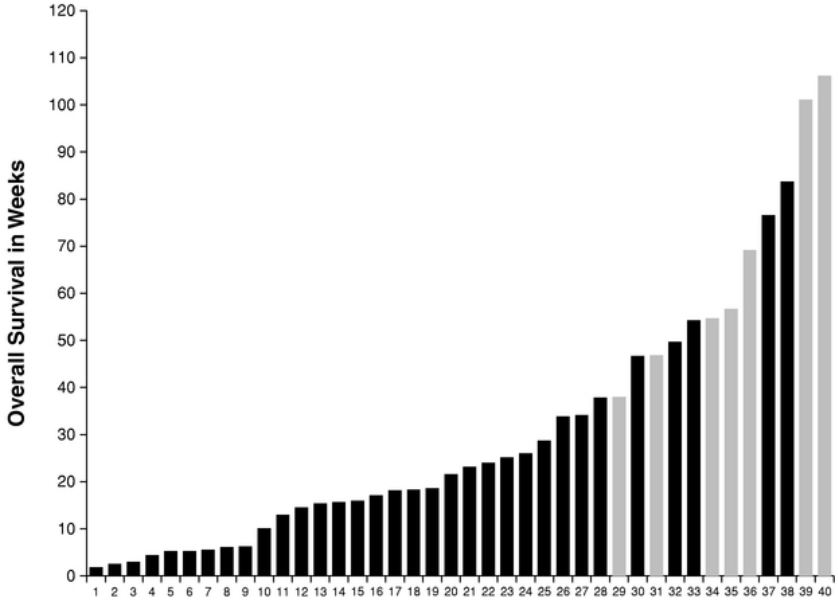
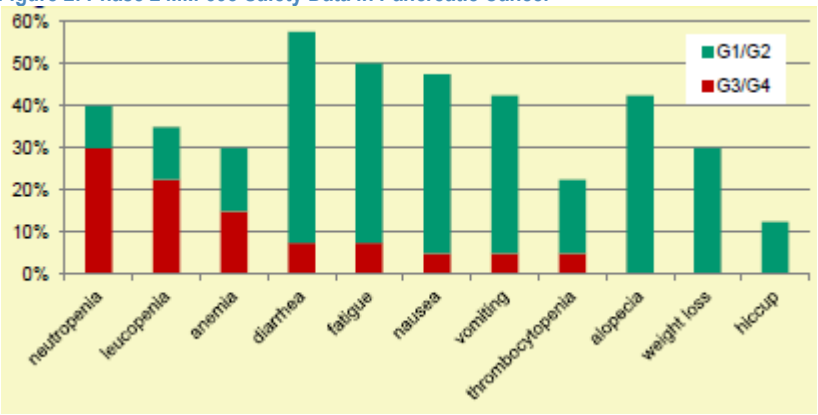
Figure 1: Phase 2 MM-398 OS Data in Pancreatic Cancer



Source: Company reports (note: grey bars represent patients still alive at May 31, 2011)

On the safety side (Figure 2), the most common adverse events included diarrhea (~57%), fatigue (~50%), nausea (~47%) vomiting (~42%) and alopecia (~42%) the majority of which was Grade 1 / 2. Grade 3 /4 toxicities were primarily hematologic in nature and included neutropenia (30%), leucopenia (22.5%), and anemia (15%). Importantly, this side-effect profile is consistent with that of irinotecan despite a higher exposure of MM-398 relative to irinotecan.

Figure 2: Phase 2 MM-398 Safety Data in Pancreatic Cancer



Source: ASCO 2011

What to Expect in Phase 3 Pancreatic Cancer

Data from the phase 3 trial of MM-398 are expected in mid-2013. Given the similar design of the MM-398 treatment arm to that of the phase 2 study, we believe a similar outcome is likely. Specifically, the dosing (120 mg/m^2 Q3W) and target patient population (second-line pancreatic cancer patients that have failed gemcitabine) are identical. One slight difference is that the phase 3 trial also includes

patients from Europe and Africa in addition to patients from the US and Asia. However, historically geography has not had a meaningful impact on the outcome of these types of studies.

Given the larger patient population and more global enrollment, the company has taken a conservative view and expects an OS of 4.5 months for MM-398, slightly lower than the 5.6 months demonstrated in phase 2. Additionally, the company expects the active comparator to demonstrate a 3.0-month OS. As such, a 1.5-month benefit is expected, but could be higher (2.6-month assuming outcome identical to phase 2), in our view. Indeed, based on our conversations, this is consistent with physician expectations. Physicians expect a similar 5.6-month OS and a historical 2-3 month OS for the active comparator. Assuming this outcome, physicians would not be surprised to see MM-398 move into first-line use both in combination with gemcitabine and replacing irinotecan in the FOLFIRINOX regimen.

Other Indications

Gastric Cancer

A phase 2 trial (n=132) evaluated MM-398 in patients with metastatic gastric or gastroesophageal junction adenocarcinoma who had failed one prior therapy. Patients received either MM-398 (120 mg/m^2), irinotecan (300 mg/m^2), or docetaxel (75 mg/m^2) every 3 weeks. The study met the primary endpoint with 6 MM-398 treated patients achieving an ORR (Table 6). The cutoff for success was ≥5 patients achieving an ORR. Doctaxel also met the primary endpoint (7 patients), but irinotecan did not (3 patients). All regimens demonstrated similar impacts on both PFS and OS. Overall, the safety profiles were fairly similar between MM-398 and irinotecan, despite increased exposure of MM-398, with less neurotoxicity relative to docetaxel (Table 7).

Table 6: Phase 2 MM-398 Efficacy in Gastric Cancer

Response	MM-398 (n=44)	Irinotecan (n=44)	Docetaxel (n=44)
ORR	6 (13.6%)	3 (6.8%)	7 (15.9%)
DCR at 6 wks	27 (61.4%)	27 (61.4%)	24 (54.6%)
Median PFS (days)	81	79.5	82
Median OS (days)	218	235	219

Source: ASCO GI 2011

Table 7: Phase 2 Grade 3 /4 Toxicity in Gastric cancer

Adverse Events	MM-398 (n=44)	Irinotecan (n=44)	Docetaxel (n=44)
Non-Hematological			
Diarrhea	12 (27.3%)	8 (18.2%)	1 (2.3%)
Nausea	5 (11.4%)	2 (4.6%)	0 (0.0%)
Vomiting	2 (4.6%)	6 (13.6%)	3 (6.8%)
Anorexia	3 (6.8%)	3 (6.8%)	0 (0.0%)
Fatigue	2 (4.6%)	1 (2.3%)	1 (2.3%)
Hematological			
Neutropenia	5 (11.4%)	7 (15.9%)	7 (15.9%)
Febrile Neutropenia	3 (6.8%)	5 (11.4%)	2 (4.6%)
Anemia	2 (4.6%)	2 (4.6%)	3 (6.8%)
Thrombocytopenia	1 (2.3%)	1 (2.3%)	0 (0.0%)

Source: ASCO GI 2011

Colorectal Cancer

MM-398 is currently in a phase 2 trial (n=88) in second-line metastatic colorectal cancer (CRC). The study is an open-label non-comparative randomized trial foMM-398 + 5-FU + LV (FUPEP) or irinotecan + 5-FU + LV (FOLFIRI), in patients progressing on an oxaliplatin-based regimen. The primary endpoint of this study is ORR, while secondary endpoints include safety, PFS, OS and quality of life. This study, which is sponsored by the GERCOR research consortium in France, began in May 2011 with data expected in mid-2013.

MM-398 was evaluated in a phase 1 (n=18) single-arm dose escalation study in patients with advanced CRC that have failed an oxaliplatin regimen. The goal of study was to asses the safety and the maximum tolerated dose. To that end, all doses tested (80 mg/m^2, 90 mg/m^{2}and 100 mg/m^2; every 2 weeks) were found to be well tolerated with 100 mg/m^2 identified as the maximum tolerated dose (MTD). Overall, MM-398 resulted in a 22.2% ORR and 72.2% DCR. These data are encouraging, considering in a separate study FOLFIRI resulted in 4% ORR and 34% DCR in oxaliplatin failures.[4] However, these data need to be confirmed in larger phase 2 and phase 3 studies, but suggested that MM-398 has the potential to replace irinotecan in the FOLFIRI regimen.

MM-398 Market Opportunity

Our model currently includes the opportunity for MM-398 in the US only. In the US, the Surveillance Epidemiology and End Result (SEER) estimate the incidence of pancreatic cancer is 42,000. Of these patients, an estimated 25% and 51% have locally advanced and metastatic disease, respectively. We assume use of MM-398 is restricted to these patients consistent with the phase 3 target population. We further assume a price of $7,000/month and an annual duration of 3.4-4.0 months. Additionally, we include modest revenues for MM-398 in other indications. As such, we forecast sales of $848M in 2021 (peak sales of $900M; Table 8).

[4] Tournigand *et. al. JCO* 2004, 22: 229-237

Table 8: MM-398 Revenue Model

US Pancreatic Revenue Model	2014	2015	2016	2017	2018	2019	2020	2021
Incidence	43,705	44,142	44,584	45,030	45,480	45,935	46,394	46,858
growth	1%	1%	1%	1%	1%	1%	1%	1%
Resectable (8%)	3,496	3,531	3,567	3,602	3,638	3,675	3,712	3,749
Locally advanced (25%)	10,926	11,036	11,146	11,257	11,370	11,484	11,599	11,715
Metastatic (51%)	22,290	22,513	22,738	22,965	23,195	23,427	23,661	23,898
Unstaged (Hospice: 16%)	6,993	7,063	7,133	7,205	7,277	7,350	7,423	7,497
Patients treated with chemo (mostly gem)	29,894	30,193	30,495	30,800	31,108	31,419	31,734	32,051
MM-398 Penetration	15%	35%	45%	55%	65%	70%	70%	70%
MM-398 Patients	4,484	10,568	13,723	16,940	20,220	21,994	22,214	22,436
Duration of Therapy	3.5	3.5	3.5	4	4	4	4	4
Price per month ($)	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000	$7,000
MM-398 US Pancreatic sales ($, M)	**$109.9**	**$258.9**	**$336.2**	**$474.3**	**$566.2**	**$615.8**	**$622.0**	**$628.2**
Total US MM-398 sales ($, M)	**$109.9**	**$284.8**	**$386.6**	**$592.9**	**$764.3**	**$831.4**	**$839.7**	**$848.1**

Source: J.P. Morgan estimates.

MM-121

MM-121 is currently in phase 2 combination trials in multiple tumors (NSCLC, breast cancer and ovarian cancer) with data expected in 2013 and 2014. MM-121 is a fully human monoclonal antibody targeting ErbB3. Phase 1 data across a variety of tumor types have been encouraging, providing further validation of targeting ErbB3. Although this program is still in early development, we believe MM-121 has potential in multiple tumors. Additionally, MM-121 is partnered with Sanofi providing further validation to this approach, in our view. We forecast peak sales of $1.3B in the US alone with Merrimack receiving $320M in royalties assuming the company opts into US co-promotion.

Mechanism of Action

MM-121 is a fully human monoclonal antibody targeting the ErbB3 receptor also known as HER3. Historically, the role of ErbB3 in cancers was largely underappreciated, but Merrimack identified the importance of this target through Network Biology and pioneered its study. Under normal conditions, ligands bind to ErbB3 activating the receptor, which can then form heterodimers with other ErbB receptors (ErbB1 and ErbB2). Heterodimerization results in activation of the ErbB3 pathway leading to cell growth and differentiation. Overactivation of the ErbB3 pathway plays a role in numerous types of cancers.

MM-121 works by preventing activation of ErbB3, thus inhibiting tumor growth. Given ErbB3's broad role, MM-121 has the potential to be used in a number of solid tumor indications including lung, breast and ovarian cancer. One of the issues with current therapies is that over time tumors can become resistant to these agents. By targeting ErbB3, MM-121 has the potential to restore tumor sensitivity of these currently available agents or delay resistance if dosed in combination with MM-121

initially. As such, MM-121 is being developed in combination with both chemotherapies and targeted agents.

In conjunction with development of MM-121, the company is also developing a companion diagnostic. The diagnostic (DX-121) consists of an assay with 5 biomarkers that assess whether a tumor is dependent on ErbB3 signaling. As such, this assay can be used to identify patients that are most likely to respond to MM-121. DX-121 is currently being tested across phase 2 trials.

Sanofi Partnership

In September 2009, Merrimack entered into a collaboration agreement with Sanofi on MM-121. Under the agreement, Sanofi was granted exclusive worldwide rights to MM-121 and is responsible for all development and manufacturing costs. In return, Merrimack received an upfront payment of $60M and is entitled to milestones of up to $470M ($410M development/regulatory milestones and $60M sales milestones) of which $25M has been received to date. Additionally, Merrimack is entitled to tiered escalating royalties on worldwide sales beginning in the sub-teen double digits in the US and high-single digits OUS.

Merrimack has the right to co-promote MM-121 in the US. If Merrimack chooses to co-promote in the US, Merrimack will be responsible for costs associated with its sales force as well as a proportion of direct medical affairs, marketing and promotion costs for MM-121. Royalties on US sales would also increase; now beginning in the high teens and escalating from there based on net sales. Additionally, Merrimack would receive a higher royalty rate if a diagnostic is used with MM-121 in solid tumors. We believe Merrimack will opt into the US co-promote for MM-121.

Multiple Phase 2 Trials of MM-121 Ongoing

MM-121 in combination with other chemotherapies and targeted agents is currently being evaluated in a number of clinical trials. Phase 2 trials in non-small cell lung cancer (NSCLC), breast cancer and ovarian cancer are currently ongoing (Table 9). We expect these studies to provide significant data flow in the 2013-14 time frame. Additionally, phase 1 trials are ongoing in advanced solid tumors and include MM-121 in combination with paclitaxel, cetuximab and irinotecan.

Table 9: MM-121 Ongoing Phase 2 Trials

	NSCLC	Breast	Breast	Ovarian
n	**229**	**130**	**200**	**210**
Population	**Group A:** No ErbB1 activating mutation that have progressed following treatment with at least on chemo containing regimen (but not ErbB1 targeted therapy. **Group B:** Have and ErbB1 activating mutation that have not received prior ErbB1 targeted therapy. **Group C:** previously responded to ErbB1 targeted therapy and acquired resistance.	Metastatic hormone sensitive breast cancer that have tested negative for over expression for ErbB2 and have failed treatment with an aromatase inhibitor or other anti estrogen therapy.	**Group A:** estrogen (ER) positive and ErbB2 negative that have not undergone prior treatment or surgery (i.e. neoadjuvant). **Group B:** ER negative, ErbB2 negative and progesterone receptor negative (i.e. triple negative) in neoadjuvant breast cancer.	Advanced ovarian cancer that are resistant or refractory to platinum based chemotherapies.
Dosing	MM-121 + erlotnib vs. erlotnib	MM-121 + exemestane vs. exemestane	MM-121 + paclitaxel vs. paclitaxel	MM-121 + paclitaxel vs. paclitaxel
Primary Endpoint	PFS	PFS	pCR	PFS
Secondary Endpoints	OS and ORR	OS, ORR and DCR		OS, ORR and duration of response
Data Expected	1H13 (Group A and C)	1H13	2H13 (Group A)	2014

Notes: PFS- progression free survival, OS- overall survival, ORR- objective response rate, DCR- disease control rate, pCR- pathologic complete response

Source: Company reports.

Review of MM-121 Phase 1 Data

Interim phase 1 data in a variety of cancers have been positive (Table 10). In advanced NSCLC, MM121 + erlotnib resulted in a 3% ORR and 47% DCR. In advanced breast and ovarian cancer, MM-121 + paclitaxel resulted in a 35% ORR and 74% DCR. Overall, based on conversations, physicians were encouraged by the phase 1 data. Importantly, confidence was high in MM-121's activity given that patients previously failing erlotnib responded to treatment with the combination.

Table 10: MM-121 Interim Phase 1 Data

	NSCLC	Breast and Ovarian
n	**32**	**23**
Population	Locally advanced/metastatic non-small cell lung cancer (NSCLC)	Locally advanced/metastatic or recurrent epithelial ovarian cancer, fallopian tube cancer, primary peritoneal cancer or endometrial cancer OR locally advanced/metastatic ErbB2 non-over expressing breast cancer (triple negative breast cancer)
Dosing	MM-121 + erlotnib	MM-121 + paclitaxel
Design	Open label dose escalation study to assess safety	Open label dose escalation study to assess safety
Interim Data	As of Jan 30, 2012- 3% (1/32) ORR and 47% DCR (15/32)	As of Jan 15, 2012- 35% (8/23) ORR and 74% DCR (17/23)
Updated Data Expected	ASCO June 1-5	2H12

Notes: ORR- objective response rate and DCR- disease control rate

Source: Company reports.

Data from both these studies are expected to be updated at medical meetings later in 2012. We note that these data are early and need to be confirmed in larger phase 2 and 3 studies, but clearly suggest these MM-121 combination regimens are active in a variety of cancers. Additionally, these data further validate ErbB3 as a meaningful target in multiple cancers.

MM-121 Market Opportunity

Our model currently includes the opportunity for MM-121 in the US only. In the US, the incidence of NSCLC is approximately 175,000 with an estimated 30% and 18% of these patients with second-line and third-line disease, respectively. We assume use of MM-121 is restricted to these later line patients. We further assume a price of $8,000/month and an annual duration of 5.0 months in second-line and 3.5 months in third-line. Additionally, we include modest revenues for MM-121 in other indications. As such, we forecast sales of $1.2B in 2021 (peak sales of $1.3B) with Merrimack receiving royalties of $320M (Table 11).

Table 11: MM-121 Revenue Model

US NSCLC Revenue Model	2014	2015	2016	2017	2018	2019	2020	2021
New cases ('000)	175.0	175.0	175.0	175.0	175.0	175.0	175.0	175.0
% NSCLC	80%	80%	80%	80%	80%	80%	80%	80%
NSCLC patients	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0
% NSCLC cases treated	80%	80%	80%	80%	80%	80%	80%	80%
Treated NSCLC patients	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0
Second Line NSCLC								
% of cases treated in second-line setting	30%	30%	30%	30%	30%	30%	30%	30%
Second Line patients treated annually	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6
MM-121 Penetration	0%	0%	0%	5%	20%	35%	50%	50%
MM-121 Patients	0.0	0.0	0.0	1.7	6.7	11.8	16.8	16.8
MM-121 Duration				5.0	5.0	5.0	5.0	5.0
Third Line NSCLC								
% of cases treated in third-line setting	18%	18%	18%	18%	18%	18%	18%	18%
Third Line plus patients treated annually	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6
MM-121 Penetration	0%	0%	5%	15%	25%	45%	60%	60%
MM-121 Patients	0.0	0.0	1.0	2.9	4.9	8.8	11.8	11.8
MM-121 Duration			3.5	3.5	3.5	3.5	3.5	3.5
Price per month ($)	$8,000	$8,000	$8,000	$8,000	$8,000	$8,000	$8,000	$8,000
Total cycles	0	0	3	19	51	90	125	125
MM-121 US NSCLC sales ($, M)			**$27.4**	**$149.5**	**$406.0**	**$717.4**	**$1,001.3**	**$1,001.3**
Other indications (BC, OC)			3	15	61	108	200	200
Total US MM-121 sales ($, M)			**$30.2**	**$164.5**	**$466.9**	**$825.0**	**$1,201.5**	**$1,201.5**
Royalties			**$6.0**	**$32.9**	**$107.4**	**$206.2**	**$300.4**	**$300.4**
% royalty			20%	20%	23%	25%	25%	25%

Source: J.P. Morgan estimates.

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MM-111

MM-111 is expected to enter phase 2 testing in 2012. MM-111 is a bi-specific antibody (targets both the ErbB2 and ErbB3) for HER2+ tumors. Phase 1 data of MM-111 in combination with other therapies across multiple HER2+ tumor types (breast cancer, bladder cancer, esophageal cancer, colon cancer and ovarian cancer) has been encouraging, providing further validation for targeting ErbB3 than that provided by MM-121 phase 1 studies. Although this program is still in early development, we believe MM-111 has potential in a subset of multiple HER2+ positive tumors. We forecast peak sales of $550M in the US alone.

Mechanism of Action

MM-111 is a bi-specific antibody that targets both the ErbB2 (or HER2) and ErbB3 (or HER3) receptors. MM-111 was specifically designed for tumors that over-express ErbB2 (HER2+) to prevent formation of the ErbB2/ErbB3/heregulin complex and thus inhibit tumor growth. Recall, this is in contrast to MM-121, which binds only to ErbB3 and is not as well suited for HER2+ tumors.

In HER2+ tumors, studies have indicated that heregulin has a high affinity for the ErbB2/ErbB3 complex, making it difficult for single and even combination therapies to be effective. As such, the bi-specific design of MM-111 offers a more potent approach to terminating tumor growth. Similar to MM-121, MM-111 also has the potential to restore tumor sensitivity to currently available agents or delay resistance if dosed in combination with MM-111 initially. As such, MM-111 is also being developed in combination with both chemotherapies and targeted agents.

A companion diagnostic is also being developed for MM-111. The diagnostic (DX-111) consists of multiple biomarkers that include assessing the levels of heregulin, ErbB2, ErbB3 to identify patients most likely to respond to therapy. DX-111 is currently being tested in phase 1 studies.

Review of MM-111 Phase 1 Data

Interim phase 1 data from the multi-arm combination (MAC) trial of MM-111 in advanced HER2+ solid tumors has been encouraging (Table 12). In this study, 3 different combination regimens of MM-111 with both chemotherapies and ErbB2 targeted agents are being tested. An interim analysis has demonstrated ORR ranging from 8% to 40% and DCR rates ranging from 23% to 80%. Focusing on breast cancer, ORR rates of 33% and 25% were achieved with regimens 1 and 2, respectively. Although these results need to be confirmed in controlled, larger phase 2 and 3 studies, these early results are encouraging and support further development.

Table 12: Interim Phase 1 MM-111 Multi-Arm Combination (MAC) Data

	Solid Tumors MAC Regimen 1	Solid Tumors MAC Regimen 2	Solid Tumors MAC Regimen 3
n (enrollment so far)	10	9	13
Population	Advanced ErbB2 positive solid tumors	Advanced ErbB2 positive solid tumors	Advanced ErbB2 positive solid tumors
Dosing	MM-111 + paclitaxel + trastuzumab	MM-111 + trastuzumab + cisplatin + capecitabine	MM-111 + trastuzumab + lapatinib
Design	Open label dose escalation study to assess safety	Open label dose escalation study to assess safety	Open label dose escalation study to assess safety
Interim Best Response (as of Feb 13, 2012)	40% (4/10) ORR and 80% DCR (8/10)	33% (3/9) ORR and 44% DCR (4/9)	8% (1/13) ORR and 23% DCR (3/13)
Breakdown by disease	Breast (n=6): 33% ORR and 83% DCR Bladder (n=3): 33% ORR and 66% DCR Esophageal (n=1): 100% ORR	Breast (n=4): 25% ORR and 25% DCR Bladder (n=3): 33% ORR and 66% DCR Colon (n=1): 100% ORR Esophageal (n=1): NA	Breast (n=9): 22% DCR Ovarian (n=2): 50% ORR Esophageal (n=2): NA
Updated Data Expected	2H12	2H12	2H12

Notes: ORR- objective response rate and DCR- disease control rate

Source: Company reports.

Following completion of phase 1 testing, phase 2 trials are expected to begin in 2012. However, the company is still in the process of formulating a phase 2 strategy regarding the design and target populations for these studies.

MM-111 Market Opportunity

Our model currently includes the opportunity for MM-111 in the US only. In the US, the number of breast cancer treated patients is approximately 335,000 with an estimated 22% of these patients having HER2+ disease. We assume use of MM-111 is restricted to first-line and second-line disease. We further assume a price of $4,000/month with an annual duration of 9.0 months in first-line and 6.0 months in second-line. Additionally, we include modest revenues for MM-111 in other indications. As such, we forecast sales of $476M in 2021 (peak sales of $550M; Table 13).

Table 13: MM-111 Revenue Model

US HER2+ Breast Cancer Market Model	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Breast Cancer Treated Patients	348,602	352,088	355,609	359,165	362,757	366,385	370,048	373,749
% HER2+	22%	22%	22%	22%	22%	22%	22%	22%
HER2+ Patients	76,693	77,459	78,234	79,016	79,807	80,605	81,411	82,225
% Adjuvant	50%	50%	50%	50%	50%	50%	50%	50%
% First Line	15%	15%	15%	15%	15%	15%	15%	15%
% Second Line Plus	35%	35%	35%	35%	35%	35%	35%	35%
First Line HER2+	11,504	11,619	11,735	11,852	11,971	12,091	12,212	12,334
MM-111 Share	0%	4%	10%	15%	18%	22%	25%	25%
Second Line Plus HER2 +	26,842	27,111	27,382	27,656	27,932	28,212	28,494	28,779
MM-111 Share	0%	4%	15%	22%	26%	30%	35%	35%
MM-111 Patients	-	1,549	5,281	7,862	9,417	11,123	13,026	13,156

Duration Assumptions

MM-111	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2021E
First Line Duration	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Second Line Plus Duration	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Price per month ($)		$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
MM-111 US BC sales ($, M)		**$42.8**	**$140.8**	**$210.0**	**$251.9**	**$298.9**	**$349.3**	**$352.7**
Other indications (Gastric, Bladder)		0	14	32	50	75	105	123
Total US MM-111 sales ($, M)		**$42.8**	**$154.9**	**$241.5**	**$302.2**	**$373.6**	**$454.0**	**$476.2**

Source: J.P. Morgan estimates.

Financial Outlook

P&L Highlights

We project 2012-15 revenues of $34M, $36M, $148M and $325M, respectively. We assume a launch of MM-398 in metastatic pancreatic cancer in 1H14 in the US with 2014-15 sales of $110M and $285M, respectively. We also assume launch of MM-111 in HER2+ breast cancer in 1H15 in the US with 2015 sales of $43M (Table 15).

We expect R&D expense to continue to grow with advancement of the broad pipeline. With respect to SG&A, we expect continued growth with the launch of MM-398 in 2014 and MM-111 in 2015. We project 2012-15 GAAP EPS of $(0.88), $(1.04), $(0.47) and $0.31, respectively.

Balance Sheet and Cash Flow

At the end of 2011, Merrimack had $50M in cash and cash equivalents. Including net proceeds raised from the IPO in March 2012, we estimate Merrimack has $157M in cash and cash equivalents. With product revenues not expected until 2014, we assume additional equity raises in the outer years (Table 16 and Table 17).

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Valuation

Sum of the Parts

Our $10 December 2012 price target for MACK shares is based on our sum-of-the-parts analysis, which includes US sales of MM-398, MM-121 and MM-111 (Table 14). In our analysis we use a discount rate of 15% (consistent with other biotech companies at similar stages of development) and assume no terminal value. For MM-398 we project US sales in pancreatic cancer to 2027 (consistent with patent expiration) with modest contributions from other indications (CRC, SCLC and GBM) and apply a 70% probability of success. This implies a value of $5.5/share. For MM-121, we apply a 50% probability of success to royalties on US sales in NSCLC to 2028 with modest contribution from other indication (BC and OC). This implies a value of $2.5/share. For MM-111 we apply a 30% probability of success to US sales in HER2+ breast cancer to 2029 with modest contribution in other cancers (gastric and bladder). This analysis implies a $0.5/share. We assume net cash of $1.5/share. Taken together, our sum-of-the-parts results in our Dec 2012 target of $10/share.

Our probability adjustments are based on the stage of clinical development and strength of available clinical data. A higher probability is assigned to assets that are more advanced and have robust prior clinical data. MM-398 is in phase 3 trials with positive data in prior phase 2 trials, warranting a 70% probability. MM-121 is in multiple phase 2 trials with data expected next year. Additionally, phase 1 data from multiple studies have been encouraging, supporting a 50% probability. Finally, MM111 remains in phase 1 trials and a phase 2 trail is not expected to begin until later this year, warranting a lower 30% probability.

Table 14: Merrimack Sum-of-the-Parts Valuation ($ in millions except per share amounts)

Sum of the Parts Analysis	Total	Per Share
MM398	$666	5.5
MM121	$301	2.5
MM111	$71	0.5
Net Cash	$157	1.5
Total	**$1,195**	**$10**

Source: J.P. Morgan estimates.

Management

Robert J. Mulroy, President and CEO

President and CEO of Merrimack Pharmaceuticals since May 1999. Previously, Mr. Mulroy worked as a management consultant supporting the strategic decisions of regional and global clients in the pharmaceutical and healthcare industries. Additionally, Mr. Mulroy advised governments and other start-ups within the biotech sector. Mr. Mulroy earned an M.S. in public and private management from Yale and received a B.A. from Stanford University.

Ulrik B. Nielsen, Ph.D., SVP and Chief Scientific Officer

Cofounder, Senior Vice President, and Chief Scientific Officer since March 2009. Dr. Nielsen also serves as the CEO of Silver Creek Pharmaceuticals. He received his Ph.D. from the University of Copenhagen in molecular biology and trained at the University of California, San Francisco. Dr. Nielsen received an M.S. and a B.S. in biochemistry from the University of Copenhagen.

Clet M. Niyikiza, Ph.D., EVP of Development

Executive Vice President of Development since February 2010 and previously Senior Vice President of Product Development (2009-10). Prior to Merrimack Pharmaceuticals, Dr. Niyikiza held multiple management roles at GSK and Eli Lilly. Most recently, Dr. Niyikiza served as VP and Medicine Development Leader at GSK overseeing product development and global anti-cancer medicine development. Dr. Niyikiza received an M.A. in Mathematics and Statistics and a Ph.D. in Mathematical Sciences from Indiana University.

Edward J. Stewart, SVP and President, Merrimack Health Solutions

President of Merrimack Healthcare Solutions since December 2011. Previously, Mr. Stewart served as SVP of Business Development (2009-11), Director of Business Development (2001-06), Senior Director of Business Development (2006-07), and VP of Business Development (2007-09). Prior to Merrimack Pharmaceuticals, Mr. Stewart was a manager in the Health Care and Life Sciences practice of KPMG. Mr. Stewart earned an M.B.A. from Cornell University and a B.A. from Bates College.

William A. Sullivan, CFO and Treasurer

Chief Financial Officer since May 2011 and Treasurer since February 2010. Previously, Mr. Sullivan held a dual role as VP of Finance (2010-11) and Controller (2007-10). Mr. Sullivan earned an M.B.A. from Northwestern and a B.A. from Williams College.

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Models

Table 15: Merrimack Income Statement

($ in millions except per share data)	2009A	2010A	2011E	2012E	2013E	2014E	2015E
R&D revenues	2.1	20.3	34.2	34.3	36.0	38.0	40.0
US MM-398 (launch 2014 US / EU not in model)	0.0	0.0	0.0	0.0	0.0	109.9	284.8
US MM-121 royalties (launch 2017 US / EU not in model)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
US MM-111 (launch 2015 US / EU not in model)	0.0	0.0	0.0	0.0	0.0	0.0	42.8
Total Revenue	**2.1**	**20.3**	**34.2**	**34.3**	**36.0**	**147.9**	**324.8**
Operating Expenses							
COGS	0.0	0.0	0.0	0.0	0.0	11.0	34.9
R&D	37.7	58.3	100.6	121.7	146.0	175.2	219.1
SG&A	12.2	11.4	14.5	17.4	20.0	25.0	33.8
Contingent consideration	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
Stock option expense	3.3	4.6	5.6	6.8	8.2	9.8	11.8
Total Operating Expenses(incl FAS123R)	**49.8**	**69.5**	**115.1**	**139.1**	**166.1**	**211.2**	**287.7**
Operating Income	**-47.7**	**-49.2**	**-80.9**	**-104.8**	**-130.1**	**-63.4**	**37.1**
Interest income	0.1	0.1	0.1	3.2	3.2	3.2	3.2
Interest expense	-4.9	-3.7	0.0	0.0	0.0	0.0	0.0
Other, net	0.0	2.7	1.2	0.0	0.0	0.0	0.0
Total Non-Operating Income (Loss)	**-4.8**	**-1.0**	**1.2**	**3.2**	**3.2**	**3.2**	**3.2**
Pretax Income	-52.5	-50.2	-79.7	-101.6	-126.9	-60.2	40.3
Taxes	-3.4	0.0	0.0	0.0	0.0	0.0	0.0
Net loss attributable to Merrimack Pharmaceuticals	-49.1	-50.1	-79.2	-101.6	-126.9	-60.2	40.3
Net Income	**-53.8**	**-61.3**	**-87.0**	**-101.6**	**-126.9**	**-60.2**	**40.3**
Diluted EPS	**-7.28**	**-5.57**	**-7.67**	**-0.88**	**-1.04**	**-0.47**	**0.31**
Diluted Shares Outstanding	7.4	11.0	11.3	115.0	121.5	128.0	129.5

Source: Company reports and J.P. Morgan estimates.

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Table 16: Merrimack Balance Sheet

($ in millions except per share data)	2009A	2010A	2011E	2012E	2013E	2014E	2015E
Assets							
Cash and cash equivalents	58.4	30.7	50.5	59.3	28.8	28.0	72.2
Restricted cash	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Accounts receivable	1.8	3.7	7.4	8.9	10.7	12.8	15.4
Prepaid expenses and other current assets	1.3	1.8	7.7	9.3	11.1	13.3	16.0
Total Current Assets	**61.5**	**36.3**	**65.6**	**77.4**	**50.6**	**54.1**	**103.6**
Property and equipment, net	6.5	7.5	6.2	6.6	7.7	9.6	12.1
Other assets	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intangible assets, net	3.1	2.8	2.5	2.5	2.5	2.5	2.5
In-process research and development	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Goodwill	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Total Assets	**82.2**	**57.6**	**85.3**	**97.5**	**71.8**	**77.2**	**129.2**
Liabilities and Shareholders' Equity							
Accounts payable	2.3	1.4	4.7	4.7	4.7	4.7	4.7
Accrued expenses	6.2	7.3	12.9	12.9	12.9	12.9	12.9
Capital lease obligations	0.8	0.4	0.0	0.0	0.0	0.0	0.0
Deferred revenue	5.1	6.5	7.7	7.7	7.7	7.7	7.7
Total Current Liabilities	**84.1**	**16.3**	**26.2**	**26.2**	**26.2**	**26.2**	**26.2**
Deferred revenues	55.9	67.3	78.0	78.0	78.0	78.0	78.0
Deferred tax incentives	0.0	0.8	1.3	1.3	1.3	1.3	1.3
Convertible preferred stock warrants	0.6	0.7	1.5	1.5	1.5	1.5	1.5
Total Liabilities	**141.6**	**85.3**	**107.0**	**107.0**	**107.0**	**107.0**	**107.0**
Total Shareholders' Equity	-59.5	-27.7	-21.7	-9.5	-35.2	-29.8	22.2
Total Liabilities and Shareholders' Equity	**82.2**	**57.6**	**85.3**	**97.5**	**71.8**	**77.2**	**129.2**

Source: Company reports and J.P. Morgan estimates.

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J.P.Morgan

Table 17: Merrimack Cash Flow Statement

($ in millions except per share data)	2009A	2010A	2011E	2012E	2013E	2014E	2015E
Cash Flows from Operating Activities:							
Net income (loss)	-49.1	-50.2	-79.7	-101.6	-126.9	-60.2	40.3
Adjustments:							
Noncash benefit on release of tax valuation allowance	-3.4	0.0	0.0	0.0	0.0	0.0	0.0
Noncash interest expense	4.8	3.7	0.0	0.0	0.0	0.0	0.0
Depreciation and amortization	2.8	4.4	5.3	5.6	5.9	6.2	6.5
Stock-based compensation	3.3	4.6	7.0	6.8	8.2	9.8	11.8
Changes in assets and liabilities:							
Accounts receivable	-1.8	-2.0	-3.7	-1.5	-1.8	-2.1	-2.6
Prepaid expenses and other current assets	-0.1	-0.6	-3.9	-1.5	-1.9	-2.2	-2.7
Accounts payable	-0.2	-0.8	3.2	0.0	0.0	0.0	0.0
Accrued expenses	2.8	1.0	5.6	0.0	0.0	0.0	0.0
Deferred revenues	59.5	12.8	12.0	0.0	0.0	0.0	0.0
Deferred lease benefits	0.8	0.2	0.1	0.0	0.0	0.0	0.0
Deferred tax incentive	0.0	1.4	1.2	0.0	0.0	0.0	0.0
Other assets and liabilities, net	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Cash From Operations	**19.1**	**-26.4**	**-52.8**	**-92.3**	**-116.5**	**-48.6**	**53.3**
Cash Flows from Investing Activities:							
Purchase of property and equipment	-5.0	-5.0	-3.8	-6.0	-7.0	-8.0	-9.0
Proceeds from sale of property and equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Purchase of marketable securities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sale of marketable securities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash acquired in acquisition	0.1	0.0	0.0	0.0	0.0	0.0	0.0
(Assignment) release of restricted cash	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Other investing activities, net	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Cash from Investing	**-4.9**	**-4.9**	**-3.7**	**-6.0**	**-7.0**	**-8.0**	**-9.0**
Cash Flows from Financing Activities:							
Proceeds from issuance of Series G, net of offering costs	0.0	0.0	76.9	0.0	0.0	0.0	0.0
Proceeds from issuance of common stock	0.2	0.3	1.7	107.1	93.0	55.8	0.0
Proceeds from issuance of convertible preferred stock of Silver Creek Pharmaceuticals	0.0	4.2	0.0	0.0	0.0	0.0	0.0
Principal payment on capital lease obligations	-1.0	-0.9	-0.4	0.0	0.0	0.0	0.0
Principal payment of long-term debt	0.0	0.0	-1.9	0.0	0.0	0.0	0.0
Net Cash from Financing	**-0.8**	**3.6**	**76.3**	**107.1**	**93.0**	**55.8**	**0.0**
Net (decrease) increase in cash and cash equivalents	13.4	-27.7	19.7	8.8	-30.5	-0.8	44.3
Cash and cash equivalents at beginning of period	45.0	58.4	30.7	50.5	59.3	28.8	28.0
Cash and cash equivalents at end of period	**58.4**	**30.7**	**50.5**	**59.3**	**28.8**	**28.0**	**72.2**

Source: Company reports and J.P. Morgan estimates.

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Merrimack Pharmaceuticals: Summary of Financials

Income Statement - Annual	FY11A	FY12E	FY13E	FY14E	Income Statement - Quarterly	1Q12E	2Q12E	3Q12E	4Q12E
Revenues	34	34	36	148	Revenues	9	9	9	9
Cost of products sold	101	122	146	175	Cost of products sold	26	29	32	34
Gross profit	(66)	(87)	(110)	(27)	Gross profit	(18)	(21)	(24)	(25)
SG&A	14	17	20	25	SG&A	4	4	4	5
R&D	26	146	175	219	R&D	32	34	122	-
Operating Income	(81)	(105)	(130)	(63)	Operating income	(22)	(25)	(28)	(30)
Note: EBITDA	(81)	(105)	(130)	(63)	Note: EBITDA	(22)	(25)	(28)	(30)
Net interest income / (expense)	0	3	3	3	Net interest income / (expense)	1	1	1	1
Other income / (expense)	-	-	-	-	Other income / (expense)	-	-	-	-
Pretax income	(80)	(102)	(127)	(60)	Pretax income	(21)	(24)	(27)	(29)
Income taxes	0	0	0	0	Income taxes	0	0	0	0
Net income - GAAP	-	-	-	-	Net income - GAAP	-	-	-	-
Net income - recurring	-	-	-	-	Net income - recurring	-	-	-	-
Diluted shares outstanding	11	115	122	128	Diluted shares outstanding	115	115	115	115
EPS - excluding non-recurring	(7.67)	(0.88)	(1.04)	(0.47)	EPS - excluding non-recurring	(0.18)	(0.21)	(0.24)	(0.25)
EPS - recurring	0.00	0.00	0.00	0.00	EPS - recurring	0.00	0.00	0.00	0.00

Balance Sheet and Cash Flow Data	FY11A	FY12E	FY13E	FY14E	Ratio Analysis	FY11A	FY12E	FY13E	FY14E
Cash and cash equivalents	50	59	29	28	Sales growth	-	-	-	-
Accounts receivable	7	9	11	13	EBIT growth	-	-	-	-
Inventories	-	-	-	-	EPS growth	-	-	-	-
Other current assets	0	0	0	0					
Current assets	66	77	51	54	Gross margin	-	-	-	-
PP&E	6	7	8	10	EBIT margin	-	-	-	-
Total assets	85	98	72	77	EBITDA margin	-	-	-	-
					Tax rate	-	-	-	-
Total debt	-	-	-	-	Net margin	-	-	-	-
Total liabilities	26	26	26	26					
Shareholders' equity	(22)	(9)	(35)	(30)	Debt / EBITDA	-	-	-	-
					Debt / Capital (book)	-	-	-	-
Net income (including charges)	-	-	-	-	Return on assets (ROA)	-	-	-	-
D&A	-	-	-	-	Return on equity (ROE)	-	-	-	-
Change in working capital	-	-	-	-	Return on invested capital (ROIC)	-	-	-	-
Other									
Cash flow from operations	-	-	-	-	Enterprise value / sales	-	-	-	-
					Enterprise value / EBITDA	-	-	-	-
Capex	-	-	-	-	Free cash flow yield	-	-	-	-
Free cash flow	-	-	-	-					
Cash flow from investing activities	-	-	-	-					
Cash flow from financing activities	-	-	-	-					
Dividends	-	-	-	-					
Dividend yield	-	-	-	-					

Source: Company reports and J.P. Morgan estimates.
Note: $ in millions (except per-share data).Fiscal year ends Dec

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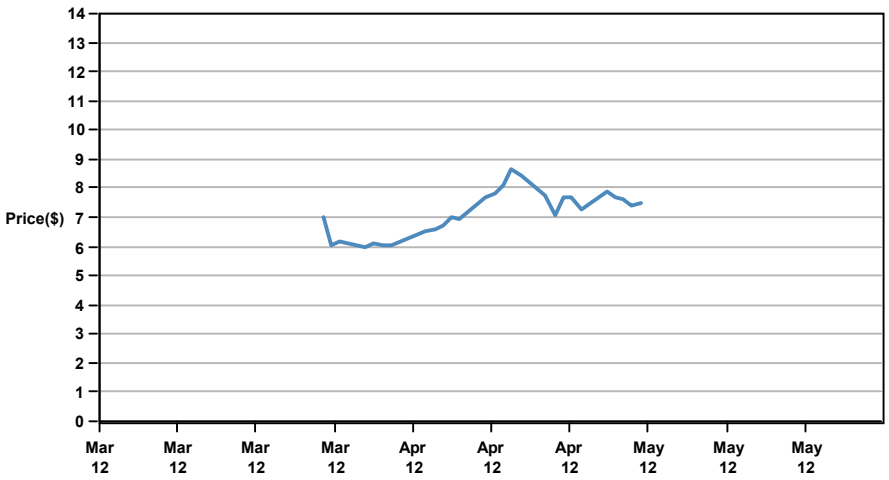
Merrimack Pharmaceuticals (MACK, MACK US) Price Chart



Source: Bloomberg and J.P. Morgan; price data adjusted for stock splits and dividends.

The chart(s) show J.P. Morgan's continuing coverage of the stocks; the current analysts may or may not have covered it over the entire period.
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	Overweight (buy)	Neutral (hold)	Underweight (sell)
J.P. Morgan Global Equity Research Coverage	45%	43%	12%
IB clients*	51%	45%	34%
JPMS Equity Research Coverage	43%	48%	9%
IB clients*	70%	61%	53%

*Percentage of investment banking clients in each rating category.
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