IMMUNOGEN INC
Form 424B5
July 12, 2012

Filed pursuant to Rule 424(b)(5)
Registration No. 333-174335

The information in this preliminary prospectus supplement is not complete and may be changed. A registration statement relating to these securities has been declared effective by the Securities and Exchange Commission. This preliminary prospectus supplement and the accompanying prospectus are not an offer to sell these securities and we are not soliciting an offer to buy these securities in any state or other jurisdiction where the offer or sale is not permitted.

SUBJECT TO COMPLETION, DATED JULY 11, 2012

PROSPECTUS SUPPLEMENT
(to Prospectus dated May 19, 2011)

Shares

Common Stock

We are offering shares of our common stock. Our common stock is listed on The NASDAQ Global Select Market under the symbol "IMGN." On July 10, 2012, the last reported sale price of our common stock on The NASDAQ Global Select Market was $17.37 per share.

Investing in our common stock involves a high degree of risk. Please read "Risk Factors" beginning on page S-17 of this prospectus supplement and in the documents incorporated by reference into this prospectus supplement.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

	PER SHARE	TOTAL
Public Offering Price	$	$
Underwriting Discounts and Commissions	$	$
Proceeds to ImmunoGen, before expenses	$	$

Delivery of shares of common stock is expected to be made on or about July , 2012. We have granted the underwriters an option for a period of 30 days to purchase up to an additional shares of our common stock.

Joint Book-Running Managers

Morgan Stanley **Jefferies**

Prospectus Supplement dated July , 2012

Table of Contents

You should rely only on the information contained or incorporated by reference in this prospectus supplement, the accompanying prospectus or any free writing prospectus that we have authorized for use in connection with this offering. Neither we nor the underwriters have authorized anyone to provide you with information different from that contained in this prospectus or any accompanying free writing prospectus. We are offering to sell, and seeking offers to buy, common stock only in jurisdictions where offers and sales are permitted. If anyone provides you with different or inconsistent information, you should not rely on it. We and the underwriters take no responsibility for, and can provide no assurance as to the reliability of, any other information that others may give you. The information contained in this prospectus supplement, the accompanying prospectus and any accompanying free writing prospectus is accurate only as of the date of this prospectus supplement, the accompanying prospectus and any such accompanying free writing prospectus, regardless of the time of delivery of this prospectus supplement, the accompanying prospectus, any such accompanying free writing prospectus or of any sale of our common stock. Our business, financial condition, results

of operations and prospects may have changed since those dates. You should read this prospectus supplement, the accompanying prospectus, the documents incorporated by reference in this prospectus supplement and the accompanying prospectus, and any free writing prospectus that we have authorized for use in connection with this offering, in their entirety before making an investment decision. You should also read and consider the information in the documents to which we have referred you in the sections of this prospectus supplement entitled "Where You Can Find More Information" and "Incorporation of Documents by Reference."

No action is being taken in any jurisdiction outside the United States to permit a public offering of the common stock or possession or distribution of this prospectus supplement, the accompanying prospectus or any free writing prospectus in that jurisdiction. Persons who come into possession of this prospectus supplement, the accompanying prospectus or any free writing prospectus in jurisdictions outside the United States are required to inform themselves about and to observe any restrictions as to this offering and the distribution of this prospectus supplement, the accompanying prospectus and any accompanying free writing prospectus applicable to that jurisdiction.

Table of Contents

About this Prospectus Supplement

On May 19, 2011, we filed with the Securities and Exchange Commission, or SEC, a registration statement on Form S-3 (File No. 333-174335) utilizing a shelf registration process relating to the securities described in this prospectus supplement, which registration statement was automatically effective upon filing. Under this shelf registration process, we may, from time to time, sell common stock and other securities, of which this offering is a part.

This document is in two parts. The first part is this prospectus supplement, which describes the specific terms of this common stock offering and also adds to and updates information contained in the accompanying prospectus and the documents incorporated by reference into the prospectus. The second part, the accompanying prospectus, gives more general information, some of which does not apply to this offering. Generally, when we refer to this prospectus, we are referring to both parts of this document combined.

If the description of the offering varies between this prospectus supplement and the accompanying prospectus, you should rely on the information contained in this prospectus supplement. However, if any statement in one of these documents is inconsistent with a statement in another document having a later date for example, a document incorporated by reference in this prospectus supplement or the accompanying prospectus the statement in the document having the later date modifies or supersedes the earlier statement.

We further note that the representations, warranties and covenants made by us in any agreement that is filed as an exhibit to any document that is incorporated by reference in the prospectus supplement or the accompanying prospectus were made solely for the benefit of the parties to such agreement, including, in some cases, for the purpose of allocating risk among the parties to such agreements, and should not be deemed to be a representation, warranty or covenant to you. Moreover, such representations, warranties or covenants were accurate only as of the date when made. Accordingly, such representations, warranties and covenants should not be relied on as accurately representing the current state of our affairs.

Unless we have indicated otherwise, or the context otherwise requires, references in this prospectus supplement and the accompanying prospectus to "ImmunoGen," "the Company," "we," "us" and "our" or similar terms are to ImmunoGen, Inc. and its subsidiaries.

Table of Contents

Prospectus Supplement Summary

This summary highlights information contained elsewhere or incorporated by reference in this prospectus supplement and the accompanying prospectus. This summary does not contain all of the information that you should consider before deciding to invest in our common stock. You should read this entire prospectus supplement and the accompanying prospectus carefully, including the "Risk Factors" section contained in this prospectus supplement, our consolidated financial statements and the related notes thereto and the other documents and information incorporated by reference in this prospectus supplement and the accompanying prospectus and the information included in any free writing prospectus that we have authorized for use in connection with this offering.

Company Overview

We develop novel, targeted antibody-based therapeutics for the treatment of cancer using our expertise in cancer biology, monoclonal antibodies, highly potent cytotoxic, or cell-killing, agents, and the design of linkers that enable these agents to remain stably attached to the antibodies while in the blood stream and be released in their fully active form after delivery to a cancer cell. An anticancer compound made using our Targeted Antibody Payload, or TAP, technology consists of a monoclonal antibody that binds specifically to an antigen target found on cancer cells with multiple copies of one of our proprietary cell-killing agents attached using one of our engineered linkers. Its antibody component enables a TAP compound to bind specifically to cancer cells that express its target antigen, the highly potent cytotoxic agent serves to kill the cancer cell and the engineered linker controls the release and activation of the cytotoxic agent inside the cancer cell. With some TAP compounds, the antibody component also has anticancer activity of its own. Our TAP technology is designed to enable the creation of highly effective, well-tolerated anticancer product candidates.

Our TAP technology is providing us with an advancing and expanding product pipeline. There are now ten TAP compounds, three of which are wholly owned by us, in clinical trials from our own programs and from our partnerships with other companies. We also have one non-conjugated, or "naked," antibody in development by one of our partners. We expect to continue to make significant investments in research and development to further advance and expand our product pipeline. As a result, we expect our operating expenses to increase significantly during our fiscal year ending June 30, 2013.

Our current collaborative partners are: Amgen Inc., Bayer HealthCare (a subgroup of Bayer AG), Biotest AG, Genentech, Inc. (a member of the Roche Group), sometimes referred to in this prospectus supplement as Roche, Eli Lilly and Company, or Lilly, Novartis Institutes for BioMedical Research, Inc., or Novartis, and Sanofi.

Our Product Pipeline

There are eleven compounds in clinical trials through our own programs and our collaborations with other companies. In addition to the partner compound already in Phase III clinical testing, we expect up to three additional partner compounds to advance into pivotal clinical testing by the end of 2013. We also expect to submit an Investigational New Drug application, or IND, for our fourth wholly

Table of Contents

owned compound in mid-2013. The following table lists the current stage of development of these compounds:

	Current Stage
Lead Compound in Development through a Collaborative Partner	
Trastuzumab emtansine (T-DM1)	Phase III
Compounds in Development by ImmunoGen	
IMGN901 (lorvotuzumab mertansine)	Phase II
IMGN853	Phase I
IMGN529	Phase I
"IMGN Next"	Preclinical
Other Compounds in Development through Collaborative Partners	
SAR3419	Phase II
BT-062	Phase I
SAR650984*	Phase I
SAR566658	Phase I
BAY 94-9343	Phase I
First Amgen TAP compound ("Amgen 1")	Phase I
Second Amgen TAP compound ("Amgen 2")	Phase I

* Non-conjugated or "naked" antibody therapeutic.

Trastuzumab Emtansine Most Advanced Compound with Our TAP Technology

Trastuzumab emtansine, often referred to as T-DM1, is the most advanced compound in development using our TAP technology. Roche expects to apply for marketing approval of T-DM1 in 2012 in the United States and Europe based on the findings from its EMILIA Phase III clinical trial. Based on this timing, T-DM1 could potentially be approved in the United States by mid-2013, which would potentially enable us to begin receiving royalties from this compound in our fiscal year ending June 30, 2014.

T-DM1 consists of trastuzumab, which is the active component of Genentech's antibody therapeutic, Herceptin® (trastuzumab), with one of our cell-killing agents, DM1, attached using our non-cleavable SMCC linker. T-DM1 is in global development by Genentech's parent company, Roche, for the treatment of HER2-positive breast cancer under a license with us to use our maytansinoid TAP technology with antibodies binding to HER2. We believe Roche also intends to develop T-DM1 for non-breast cancer uses such as HER2-positive gastric cancer. Roche markets Herceptin, which had global sales of approximately 5.3 billion Swiss francs, or approximately US$5.6 billion, in 2011 based on public reports from Roche and current exchange rates.

Based on the clinical results received to date, we believe that T-DM1 has the potential to be a valuable new therapeutic for the treatment of patients with HER2-positive cancer.

Development for HER2-positive Metastatic Breast Cancer

Roche is evaluating T-DM1 for HER2-positive metastatic breast cancer in three Phase III clinical trials: EMILIA, MARIANNE and TH3RESA.

EMILIA This lead Phase III clinical trial is a randomized 991-patient study comparing T-DM1, used alone, to Tykerb® (lapatinib) used with Xeloda® (capecitabine) to treat patients with HER2-positive metastatic breast cancer who have previously been treated with Herceptin and with a

Table of Contents

taxane. Findings from EMILIA were reported on June 3, 2012 at the American Society of Clinical Oncology, or ASCO, annual meeting. Among the findings reported were:

Treatment with T-DM1 significantly improved progression-free survival, or PFS, compared to treatment with Tykerb plus Xeloda. Median PFS was 9.6 months with T-DM1 compared to 6.4 months with Tykerb plus Xeloda and the hazard ratio was 0.65 ($p<0.0001$).

As expected, overall survival, or OS, data were not mature at the time of this analysis. The statistical plan had called for an interim analysis of OS to be conducted when PFS was mature and for a final analysis of OS to be conducted after approximately 632 deaths had occurred.

While the OS data were not mature, a sufficient number of deaths had occurred in the Tykerb plus Xeloda group to establish median OS for that treatment group as 23.3 months. Longer follow-up is required to determine the median OS for the T-DM1 group. The interim differences between the T-DM1 and the Tykerb plus Xeloda treatment groups had a hazard ratio of 0.621 ($p=0.0005$). This was not statistically significant based on criteria related to the pre-defined "stopping boundary" used to analyze the data available at the analysis point.

The estimated 1-year and 2-year survival rates based on OS data at the time of the data analysis are shown in the figure below.

The EMILIA data reported that the patients randomized to treatment with T-DM1 had a median dose intensity of 99.9%, while the patients randomized to treatment with Tykerb plus Xeloda had a median dose intensity of 93.4% for Tykerb and 77.2% for Xeloda. Dose intensity is a measure of the amount of a therapeutic that a patient received relative to the amount of the therapeutic the patient was scheduled to receive across the course of their treatment period. Dose reduction below the scheduled amount typically occurs because a patient is unable to tolerate the full dose of the therapeutic.

The EMILIA data reported included that fewer T-DM1-treated patients experienced Grade 3 or higher adverse events, which are severe adverse events, than the patients treated with Tykerb plus Xeloda: 40.8% versus 57%, respectively. The most frequently reported Grade 3 and higher

Table of Contents

adverse events for Tykerb plus Xeloda and for T-DM1 are shown in the tables below (the bolded information represents higher frequency of the reported event).

	Tyberb plus Xeloda		T-DM1	
Non-Hematologic	**Any Grade**	**Grade ≥ 3**	**Any Grade**	**Grade ≥ 3**
Most frequently reported with Tykerb plus Xeloda				
Diarrhea	79.7%	**20.7%**	23.3%	1.6%
Hand-foot syndrome	58.0	**16.4**	1.2	0.0
Vomiting	29.3	**4.5**	19.0	0.8
Hypokalemia (low potassium)	8.6	**4.1**	8.6	2.2
Most frequently reported with T-DM1				
Increased AST (type of liver enzyme)	9.4	0.8	22.4	**4.3**
Increased ALT (type of liver enzyme)	8.8	1.4	16.9	**2.9**

	Tykerb plus Xeloda			T-DM1		
Hematologic	**Any Grade**	**Gr 3**	**Gr 4**	**Any Grade**	**Gr 3**	**Gr 4**
Most frequently reported with Tykerb plus Xeloda						
Neutropenia (low white blood cells)	8.6%	**3.5%**	**0.8%**	5.9%	1.6%	0.4%
Febrile neutropenia	1.0	**0.4**	**0.6**	0.0	0.0	0.0
Most frequently reported with T-DM1						
Anemia (low red blood cells)	8.0	1.6	0.0	10.4	**2.7**	**0.0**
Thrombocytopenia (low platelets)	2.5	0.0	0.2	28.0	**10.4**	**2.4**

Roche has noted that it plans to use the data from EMILIA to apply in 2012 for marketing approval of T-DM1 in the United States and Europe. This submission timing would enable us to begin receiving royalties on T-DM1 sales in our fiscal year ending June 30, 2014, assuming the marketing application is successfully accepted and approved. Marketing approval, if granted, is expected to be for use of T-DM1 to treat the cancer treated in the trial, which was HER2-positive metastatic breast cancer in patients that had previously been treated with Herceptin and with a taxane in any setting. Separately, Chugai, another member of the Roche Group, has noted that it expects to apply in 2013 for marketing approval of T-DM1 in Japan.

MARIANNE This Phase III clinical trial assesses both T-DM1 used alone and T-DM1 used together with pertuzumab for first-line treatment of HER2-positive metastatic breast cancer and compares these two treatment arms to Herceptin used together with a taxane, which is standard first-line treatment for this cancer. Roche has noted that it intends to apply in 2014 for marketing approval both for T-DM1 used alone and for T-DM1 used with pertuzumab as first-line treatments for this cancer using data from MARIANNE, assuming the findings are favorable. Roche has indicated that patient enrollment in MARIANNE has been completed. The primary endpoint of MARIANNE is PFS. We expect data from this clinical trial to be reported in 2013.

In a separate 137-patient Phase II clinical trial comparing T-DM1 used alone to Herceptin used with a taxane for first-line treatment of HER2-positive metastatic breast cancer, T-DM1 demonstrated significant improvement in PFS as compared to the Herceptin plus a taxane treatment arm and the hazard ratio was 0.59 (p=0.0353).

	T-DM1	**Herceptin plus taxane**	**Hazard ratio**
Progression-free survival (median)	14.2 months	9.2 months	0.59 (p=0.0353)

Table of Contents

Also, fewer Grade 3 or greater adverse events were reported by the patients treated with T-DM1 than those treated with Herceptin plus the taxane, and far fewer T-DM1-treated patients reported hair loss.

	T-DM1	Herceptin plus taxane
Incidence of Grade ≥ 3 adverse events	46%	89%
Incidence of alopecia (hair loss)	4%	67%

TH3RESA This Phase III clinical trial evaluates T-DM1 as a treatment for HER2-positive metastatic breast cancer that was previously treated with Herceptin and Tykerb. This clinical trial started in 2011 and compares T-DM1 to the physician's choice of treatment, since there are no standard treatments for this cancer.

Development for Early Stage HER2-positive Breast Cancer

On June 3, 2012, Roche presented its three-pronged approach to developing T-DM1 for the treatment of early stage HER2-positive breast cancer: development for neoadjuvant use, for adjuvant use, and for patients with residual invasive disease following surgery. Roche has announced that it plans to conduct clinical trials that may be used to support registration of T-DM1 in each of these settings.

Neoadjuvant Roche's strategy in the neoadjuvant setting, or treatments used in conjunction with surgery, is designed to leverage use of pathological complete response, or pCR, as a surrogate endpoint. In its neo-adjuvant trial, Roche expects to compare treatment with T-DM1 (with and without pertuzumab) to treatment with Herceptin (with and without pertuzumab). Patients will be randomized to one of four treatment groups: (1) Herceptin plus docetaxel plus carboplatin pre-surgery and Herceptin alone post-surgery; (2) Herceptin plus pertuzumab plus docetaxel plus carboplatin pre-surgery and Herceptin plus pertuzumab post-surgery; (3) T-DM1 plus docetaxel pre-surgery and T-DM1 alone post-surgery; and (4) T-DM1 plus pertuzumab plus docetaxel pre-surgery and T-DM1 plus pertuzumab alone post-surgery. Roche expects patient dosing in this clinical trial to begin in the first quarter of 2013 and pCR data to be available in 2015.

Adjuvant In Roche's clinical trial in the adjuvant setting, Roche expects to evaluate T-DM1 used with pertuzumab as a primary treatment for patients with early stage HER2-positive breast cancer compared to Herceptin used with pertuzumab. Consistent with an approved use of Herceptin in the adjuvant setting, the treatments will be used in conjunction with an anthracycline-based regimen. Also consistent with the approved adjuvant use of Herceptin, patients must have HER2-positive breast cancer that has spread into lymph nodes and/or is estrogen receptor-/progesterone receptor-negative. The primary endpoint of the clinical trial is disease-free survival. Roche expects this clinical trial to begin in 2013 and to report data from the trial in 2018.

Residual invasive disease This clinical trial is expected to evaluate T-DM1 compared to Herceptin as a treatment for patients with HER2-positive breast cancer with residual invasive disease following surgery, which Roche believes is a high unmet medical need. The primary endpoint of this clinical trial is 3-year disease-free survival. Roche expects this clinical trial to begin in the first quarter of 2013 and to report data from the trial in 2018.

IMGN901 Our Lead Wholly Owned Compound

Lorvotuzumab mertansine, or IMGN901, is wholly owned by us. We are evaluating this TAP compound in Phase II testing for the first-line treatment of small-cell lung cancer, or SCLC. We also are completing a Phase I clinical trial assessing IMGN901 for the treatment of multiple myeloma, or MM.

Table of Contents

We developed IMGN901 to bind to and kill cancer cells that express CD56, its target. The antibody component of IMGN901 serves to target our attached cytotoxic agent specifically to CD56-expressing cancer cells and has not been shown to have meaningful anticancer activity of its own. We believe IMGN901 is an example of how our TAP technology can be used to create targeted, antibody-based therapies for more types of cancers than have been able to be treated with non-conjugated or "naked" antibodies.

A number of different types of cancers express CD56, including small-cell carcinomas, such as SCLC and Merkel cell carcinoma, or MCC, many cases of OC, carcinoid tumors and other solid tumors of neuroendocrine origin. CD56-expressing cancers also include MM, NK lymphomas and select other liquid tumors.

Based on our studies, we believe that CD56 is expressed on approximately 89% of SCLC cases and approximately 76% of MM cases. Based on American Cancer Society estimates, we believe that approximately 29,400 new cases of SCLC and 21,700 new cases of MM will be diagnosed in the United States in 2012. IMGN901 has received orphan drug designations for SCLC, MCC and for MM in the United States and Europe.

Evaluation for SCLC

IMGN901 is in Phase II clinical testing for the first-line treatment of SCLC. Assuming this clinical trial is successful, we intend to advance IMGN901 into pivotal clinical testing for this indication.

Rationale We chose to focus the development of IMGN901 on first-line treatment of SCLC for several reasons. SCLC almost universally expresses CD56 and is a prevalent and highly aggressive cancer with limited treatment options. Median survival for patients diagnosed with SCLC extensive disease is less than one year. This is in part because current first-line standard-of-care for such SCLC achieves a median PFS of only five to six months and patients typically decline rapidly once they relapse. We believe that use of IMGN901 as a first-line therapy provides access to the largest SCLC market and the best opportunity for IMGN901 to make a meaningful difference for patients with this cancer.

Evidence of activity was seen with IMGN901 in early clinical trials in which it was assessed as a single agent in patients with previously treated SCLC. IMGN901 has also shown evidence of activity against MCC. In an early stage clinical trial that included 21 evaluable patients with MCC, three patients had complete responses following treatment with IMGN901, another patient had an unconfirmed partial response and four other patients had clinically relevant stable disease.

Assessment of IMGN901 for first-line treatment of SCLC extensive disease requires that it can safely be used in combination with first-line standard-of-care for this cancer, since such therapy needs to be provided to patients newly diagnosed with this cancer. The tolerability profile of IMGN901 when used as a single agent supported that it should be able to be safely assessed in combination with etoposide/carboplatin, a current first-line standard-of-care for SCLC. We have completed dose assessment of IMGN901 used in combination with etoposide/carboplatin and expect to present the clinical findings at a medical conference in September 2012.

We also believe IMGN901 in combination with etoposide/carboplatin may provide improved efficacy because IMGN901 works by a different mechanism of action than etoposide/carboplatin and, in preclinical studies, IMGN901 has shown substantially increased activity used in combination with other active agents.

NORTH clinical trial We began patient recruitment in our NORTH Phase II clinical trial in March 2012. This clinical trial assesses IMGN901 as first-line treatment for SCLC extensive disease at the dose established in the Phase I dose escalation stage. The NORTH clinical trial is designed to

Table of Contents

evaluate whether the addition of IMGN901 to etoposide/carboplatin can meaningfully improve duration of PFS over that achieved by etoposide/carboplatin alone.

All patients enrolled in NORTH are to receive a standard six cycles of treatment with etoposide/carboplatin. Two out of every three patients enrolled are randomized to receive IMGN901 in addition to the six cycles of etoposide/carboplatin. Once the etoposide/carboplatin cycles are completed, these patients can elect to also continue to receive IMGN901 as a single agent if they are benefiting from treatment.

Our NORTH clinical trial utilizes a Simon Two-Stage Design. This means that after the first 59 patients are enrolled (39 in the IMGN901 plus etoposide/carboplatin group and 20 in the etoposide/carboplatin alone group), these patients will be followed for an interim analysis, assessment of PFS at 6 months, while patient enrollment in the NORTH clinical trial continues. The interim analysis will examine whether the addition of IMGN901 to etoposide/carboplatin achieved a pre-defined level of improvement compared to etoposide/carboplatin used alone. This level of improvement threshold was developed based on historic data and will serve as a basis for us to move forward with certain IMGN901 pivotal development decisions, which we expect to be able to make in 2013.

The full NORTH Phase II clinical trial is designed to include 80 patients in the IMGN901 plus etoposide/carboplatin group and 40 patients in the etoposide/carboplatin alone group. Its primary endpoint is PFS and its secondary endpoints are PFS at 6 months, OS, OS at 12 months, time to progression, and objective response rate.

Evaluation for Multiple Myeloma

IMGN901 is being assessed in a Phase I clinical trial for the treatment of MM in combination with lenalidomide plus dexamethasone, a standard of care for this cancer. Promising data were presented at the ASCO annual meeting in June 2011 from the dose-finding portion of this clinical trial. We expect to report data from an expansion phase of this clinical trial at a medical meeting in late 2012. Based on the findings to date, we believe IMGN901 is a potential treatment for MM. However, because of the number of new therapies for MM and in order to focus our IMGN901 development program on SCLC, we currently have no plans to advance IMGN901 into pivotal testing for the treatment of MM.

IMGN853 Our Folate Receptor-Targeting TAP Compound

Our wholly owned IMGN853 TAP compound targets folate receptor 1, or FOLR1, which is over-expressed on many cases of ovarian cancer, or OC, and other carcinomas, including non-small cell lung cancer, or NSCLC. The expansion phase of our IMGN853 Phase I clinical trial will evaluate the compound specifically in patients with epithelial OC, the most prevalent type of OC, and in patients with adenocarcinoma NSCLC, the most prevalent type of lung cancer. Based on American Cancer Society estimates, we believe that approximately 19,000 new cases of epithelial OC and 90,000 new cases of adenocarcinoma NSCLC will be diagnosed in the United States in 2012.

IMGN853 consists of our FOLR1-targeting antibody with one of our potent cell-killing agents attached using one of our engineered linkers to counteract the multi-drug resistance that many cancers develop. The antibody component of IMGN853 binds to a different site than folate, enabling IMGN853 to avoid competing with dietary folate for binding sites on cancer cells.

The IMGN853 Phase I clinical trial is designed to define the path(s) to potential regulatory approval for IMGN853. The dose-escalation portion of the clinical trial, used to establish the maximum-tolerated dose, or MTD, of IMGN853, has features designed to expedite its completion. This phase of the clinical trial is open to patients with any previously treated epithelial malignancy that over-expresses FOLR1 and allows for single-patient cohorts at the initial, lower dose levels. Once the MTD is defined, IMGN853 will be evaluated in three disease-specific expansion cohorts: (1) patients

Table of Contents

with platinum-resistant/refractory epithelial OC; (2) patients with epithelial OC that is relapsed/refractory to conventional treatments; and (3) patients with adenocarcinoma NSCLC that is relapsed/refractory to conventional treatments. We expect to report the first clinical data with IMGN853 in 2013 and expect data from this Phase I clinical trial to enable us to make certain IMGN853 pivotal development decisions in 2013.

IMGN529 TAP Compound with Both Antibody and Cytotoxic Agent Anticancer Activity

Our wholly owned IMGN529 TAP compound is a potential therapy for CD37-expressing liquid tumors including non-Hodgkin's lymphoma, or NHL, and chronic lymphocytic lymphoma, or CLL. Its CD37 target has an expression profile similar to that of CD20, the target of Rituxan® (rituximab) on NHL subtypes.

IMGN529 has a unique profile for a therapy for NHL as it is an ADC, unlike the naked antibody Rituxan or radioactive therapies, and in preclinical testing, its antibody component alone has demonstrated pronounced anticancer activity, unlike other ADCs in development for NHL including SAR3419. In preclinical studies using CD37-expressing cancer cells, the antibody component of IMGN529 provided evidence of strong pro-apoptotic, or direct cell-killing activity, as well as antibody-dependent cellular cytotoxicity, or ADCC, and complement-dependent cytotoxicity, or CDC, activity. In preclinical studies, the antibody component of IMGN529 continued to demonstrate these anticancer properties after our potent cell-killing agent was attached to it, which provides it with an additional, and highly effective, method of killing cancer cells.

In April 2012, we initiated clinical testing of IMGN529. This Phase I, multi-center clinical trial is open to patients with relapsed or relapsed/refractory CD37-expressing NHL. Patients with any of the most common types of NHL are eligible for enrollment, including follicular lymphoma, diffuse large B-cell lymphoma, mantle cell lymphoma, and marginal zone lymphoma.

We expect to report the first clinical data with IMGN529 in 2013, and to be able to use data from this Phase I clinical trial to make certain IMGN529 development-related decisions in 2013.

"IMGN Next"

We are continuing to build our product pipeline and expect to advance our next wholly owned TAP compound to IND stage by mid-2013. We intend to present the first data on this compound, including the first preclinical findings, at a scientific conference in April 2013.

Other Product Candidates in Development through Our Collaborations

SAR3419 is in development by Sanofi. We created this TAP compound, including its antibody component, and licensed it to Sanofi as part of a broader collaboration. SAR3419 targets CD19 and is a potential new treatment for CD19-expressing B-cell malignancies including NHL and B-cell acute lymphoblastic leukemia, or B-ALL. Sanofi initiated Phase II clinical testing of SAR3419 in October 2011 and is evaluating it for both diffuse large B-cell lymphoma and for B-ALL. We believe initial data from one of the Phase II clinical trials underway with SAR3419 will be presented at a medical meeting in late 2012.

In its Phase I assessment, SAR3419 was found to demonstrate activity across an array of NHL histological subtypes and in patients with Rituxan-refractory and -responsive disease. Alternative dosing schedules were evaluated to establish the recommended Phase II schedule. At the recommended Phase II dose and schedule reported at the 2012 ASCO annual meeting, 29% (six out of 21) of patients had an objective response and another 43% (nine out of 21) had stable disease when treated with SAR3419.

Table of Contents

BT-062 was created by Biotest under a license agreement that grants Biotest the exclusive right to use our maytansinoid TAP technology with antibodies that target CD138, an antigen found on MM and certain other cancers. We have opt-in rights with respect to BT-062 in the United States. BT-062 is in clinical testing for the treatment of MM, and Biotest is now also considering evaluating it for the treatment of certain types of CD138-expressing solid tumors.

SAR650894 advanced into Phase I clinical testing in 2010 through our collaboration with Sanofi. It consists of a CD38-targeting antibody that has demonstrated anticancer activity in preclinical testing and does not have a separate cytotoxic agent attached. Sanofi is developing it for the treatment of certain hematological malignancies.

SAR566658 also advanced into clinical testing in 2010 through our collaboration with Sanofi. It targets CA6, which is found on breast, ovarian, cervical, lung and pancreatic tumors. SAR566658 is in Phase I clinical testing for the treatment of solid tumors that express this antigen.

The TAP compound, *BAY 94-9343*, advanced into clinical testing in 2011 through our collaboration with Bayer HealthCare. It targets mesothelin and is in Phase I clinical testing for the treatment of solid tumors that express this antigen. Also, two TAP compounds that we refer to as *Amgen 1* and *Amgen 2* advanced into clinical testing in early 2012 through our collaboration with Amgen.

We believe that as many as three of these partner compounds could advance into pivotal clinical testing by the end of 2013 based on communications with our collaborative partners.

In addition to Roche, Sanofi, Biotest, Bayer HealthCare and Amgen, we also have active partnerships with Novartis and Lilly. These collaborations were established in late 2010 and 2011, respectively, and consequently the product programs are at earlier stages of development than those of earlier collaborations.

Clinical Experience with T-DM1 and Other Compounds Utilizing Our TAP Technology

Clinical findings have been reported with a number of TAP compounds. While Phase II and Phase III clinical trial data has only been reported with T-DM1 to date, findings from Phase I clinical trials have been reported with other TAP compounds including IMGN901, SAR3419 and BT-062. The findings reported support the lack of a single, or "class", toxicity with use of our technology, such as cross-product reports of clinically significant neutropenia, peripheral neuropathy, and/or gastrointestinal toxicities. Rather, the toxicity reported has varied depending on the TAP compound and its target, as would be expected with the technology performing as intended, with a notable lack of clinically significant bone marrow suppression.

The tolerability profiles of TAP compounds support their assessment in combination with other anticancer agents, which can further enhance efficacy and can also enable evaluation of the compounds in earlier lines of therapy. One or more clinical trials have been initiated assessing T-DM1, IMGN901 and SAR3419 as part of combination regimens.

TAP compounds have been safely administered at dose levels at which a naked antibody can have anticancer activity. For example, in an early clinical trial, T-DM1 was safely dosed at 2.4 mg/kg per week, which is greater than the approved 2 mg/kg weekly dose of Herceptin, the same trastuzumab antibody used in T-DM1. This is believed to broaden the utility of our technology as it can be used with antibodies that have anticancer properties with the expectation that the MTD achieved with the resulting TAP compounds will be at a level at which the antibody component can contribute meaningful anticancer activity in addition to that provided by the attached cell-killing agent.

Two antibody-drug conjugates, or ADCs, have gained approval to treat hematological malignancies, although one (Mylotarg®) has since been withdrawn from the market. To date, T-DM1 is the only ADC to have demonstrated significant efficacy in a solid tumor indication in a controlled clinical trial. We believe the effectiveness of our TAP technology in a solid tumor indication is important as solid tumors

Table of Contents

are the most prevalent type of cancers. Of the 1.6 million cases of cancer projected to be diagnosed in the United States in 2012, 90% are for solid tumors.

Out-licenses and Collaborations

We selectively out-license restricted access to our TAP technology to other companies to provide us with cash to fund our own product programs and to expand the utilization of our technology. These agreements typically provide the licensee with rights to use our TAP technology with any of its antibodies to develop products to a defined target. The licensee is generally responsible for the development, clinical testing, manufacturing, registration and commercialization of any resulting product candidate. As part of these agreements, we are generally entitled to receive upfront fees, and also potential milestone payments, royalties on the commercial sales of any resulting products and research and development funding based on activities performed at our collaborative partner's request. We are also compensated for preclinical and clinical materials supplied to our partners.

We will not receive royalty payments from a TAP technology out-license until a product candidate developed under the license is approved for marketing and commercialized, nor do we expect to receive significant individual milestone payments under our existing collaborations prior to product approval. Achievement of product approval requires, at a minimum, favorable completion of preclinical development and evaluation, assessment of early-stage clinical trials, advancement into pivotal Phase II and/or Phase III clinical testing, completion of this later-stage clinical testing with favorable results, and completion of regulatory submissions and review. The only collaboration that may provide us with royalty revenue and significant milestone payments in the foreseeable future is our collaboration with Roche relating to T-DM1. Below is a table setting forth our active collaborations, the number of targets licensed and current status of the product candidates being developed thereunder:

Collaborator	Agreement Type	Effective Date(s)	Development Status[1]
Roche[2]	Single-target	2000	Phase III
Amgen[3]	Right-to-test and single-target	2000	Phase I
Sanofi	Multiple single-targets	2003	Phase II
Sanofi[4]	Right-to-test	2006	Research/Preclinical
Biotest	Single-target	2006	Phase I
Bayer HealthCare	Single-target	2008	Phase I
Novartis[4]	Right-to-test	2010	Research/Preclinical
Lilly[4]	Right-to-test	2011	Research/Preclinical

(1) For collaborations involving multiple targets, development status denotes the most advanced program under the collaboration.

(2) Roche has five single-target licenses. Pursuant to the license covering the target HER2, which was entered into in 2000, a product candidate, T-DM1, is in Phase III clinical trials. The remaining four licenses were entered into between 2005 and 2008, and the development status of product candidates under each of those licenses is research/preclinical.

(3) Amgen has multiple outstanding exclusive and non-exclusive options providing it with the right to take single-target licenses, on pre-negotiated terms, to specified targets during the respective option periods. As of March 31, 2012, Amgen has taken two single-target licenses pursuant to the terms of its right-to-test agreement.

(4) Sanofi, Novartis and Lilly each has the right to take multiple exclusive options providing it with the right to take single-target licenses, on pre-negotiated terms, to specified targets during the respective option periods.

Table of Contents

Roche

In May 2000, we granted Roche, through its Genentech unit, an exclusive development and commercialization license to our maytansinoid TAP technology for use with antibodies or other proteins that target HER2, such as trastuzumab. The product candidate T-DM1 is currently in development under this agreement. We received a $2 million upfront payment from Roche upon execution of the agreement. We are also entitled to receive up to a total of $44 million in milestone payments, plus tiered royalties in the mid-single digits on the commercial sales of any resulting products. On an individual country basis, royalties on commercial sales will be reduced to the low-single digits at any time during the applicable royalty period that the product is not covered by ImmunoGen patent rights in that country.

Roche may terminate this agreement for convenience at any time upon 90 days' prior written notice to us. The agreement may also be terminated by either party for a material breach by the other, subject to notice and cure provisions. Unless earlier terminated, the agreement will continue in effect until the expiration of Roche's royalty obligations. For each product and country, Roche's royalty obligations commence with the first commercial sale of that product in that country, and extend for a period of 10 years from the date of that first commercial sale in that country, although if the product (or its manufacture, use or sale) is covered by an ImmunoGen patent in that country on such tenth anniversary, then the period during which royalties are payable is extended until 12 years from the date of the first commercial sale in that country.

Through March 31, 2012, we have earned and received a total of $13.5 million in milestone payments under this agreement.

Amgen

In September 2000, we entered into a ten-year right-to-test agreement with Abgenix, Inc. which was later acquired by Amgen. The agreement provides Amgen with the right to (a) test our maytansinoid TAP technology with Amgen's antibodies under a right-to-test, or research, license, (b) take options, with certain restrictions, to individual targets selected by Amgen on either an exclusive or non-exclusive basis for specified option periods and (c) upon exercise of those options, take exclusive or non-exclusive licenses to use our maytansinoid TAP technology to develop and commercialize products directed to the specified targets on previously agreed-upon terms. Amgen no longer has the right to take additional options under the right-to-test agreement, although multiple outstanding options remain in effect for the remainder of their respective option periods.

For each exclusive development and commercialization license taken, we are entitled to receive an exercise fee of $1 million and up to a total of $34 million in milestone payments, plus royalties on the commercial sales of any resulting products.

Amgen may terminate each development and commercialization license for convenience upon prior notice to us. Each license may also be terminated by either party for a material breach by the other, subject to notice and cure provisions. Unless earlier terminated, each license will continue in effect until the expiration of Amgen's royalty obligations, which are determined on a product-by-product and country-by-country basis. For each product and country, Amgen's royalty obligations commence with the first commercial sale of that product in that country, and extend until the later of either the expiration of the last-to-expire ImmunoGen patent covering that product in that country or the expiration for that country of the minimum royalty period specified in each development and commercialization license.

Under the right-to-test agreement, in September 2009 and November 2009, we entered into two development and commercialization licenses with Amgen and received an exercise fee of $1 million with each license taken. In November 2011, INDs for two compounds developed under the separate development and commercialization licenses became active, which triggered two $1 million milestone payments to us.

Table of Contents

Sanofi

Collaboration Agreement In July 2003, we entered into a broad collaboration agreement with Sanofi (formerly Aventis) to discover, develop and commercialize antibody-based products. The collaboration agreement provides Sanofi with worldwide development and commercialization rights to new antibody-based products directed to targets that are included in the collaboration, including the right to use our TAP technology and our humanization technology in the creation of products directed to these targets. The product candidates (targets) currently in development under the collaboration include SAR3419 (CD19), SAR650984 (CD38), SAR566658 (DS6, also known as CA6) and at least one earlier-stage compound. For each of the targets included in the collaboration at this time, we are entitled to receive up to a total of $21.5 million in milestone payments, plus royalties on the commercial sales of any resulting products.

The agreement may be terminated by either party for a material breach by the other, subject to notice and cure provisions. Unless earlier terminated, the agreement will continue in effect until the expiration of Sanofi's royalty obligations, which are determined on a product-by-product and country-by-country basis. For each product and country, Sanofi's royalty obligations commence upon first commercial sale of that product in that country, and extend until the later of either the expiration of the last-to-expire ImmunoGen patent covering that product in that country or the expiration for that country of the minimum royalty period specified in the agreement.

The collaboration agreement also provides us an option to certain co-promotion rights in the United States. on a product-by-product basis. The terms of the collaboration agreement allow Sanofi to terminate our co-promotion rights if there is a change in control of our company.

Through March 31, 2012, we have earned and received a total of $16 million in milestone payments related to compounds covered under this agreement now and in the past, including a total of $5 million in milestone payments related to two product candidates previously in the collaboration that have been returned to us along with the rights to the respective targets.

Right-to-Test Agreement In December 2006, we entered into a separate right-to-test agreement with Sanofi. The agreement provides Sanofi with the right to (a) test our maytansinoid TAP technology with Sanofi's antibodies to targets that were not included in the collaboration agreement described above under a right-to-test, or research, license, (b) take exclusive options, with certain restrictions, to individual targets selected by Sanofi for specified time periods and (c) upon exercise of those options, take exclusive licenses to use our maytansinoid TAP technology to develop and commercialize products directed to the specified targets on terms agreed upon at the inception of the right-to-test agreement. The right-to-test agreement had a three-year original term from the activation date that was extended on a one-time basis by Sanofi in August 2011 for an additional three years by payment of a $2 million extension fee.

For each development and commercialization license taken, we are entitled to receive an exercise fee of $2 million and up to a total of $30 million in milestone payments, plus royalties on the commercial sales of any resulting products.

Each development and commercialization license may be terminated by either party for a material breach by the other, subject to notice and cure provisions. Unless earlier terminated, each license will continue in effect until the expiration of Sanofi's royalty obligations, which are determined on a product-by-product and country-by-country basis. For each product and country, Sanofi's royalty obligations commence with the first commercial sale of that product in that country, and extend until the later of either the expiration of the last-to-expire ImmunoGen patent covering that product in that country or the expiration for that country of the minimum royalty period specified in each development and commercialization license. No development and commercialization license has yet been taken under the right-to-test agreement.

Table of Contents

Biotest

In July 2006, we granted Biotest an exclusive development and commercialization license to our maytansinoid TAP technology for use with antibodies that target CD138. The product candidate BT-062 is currently in development under this agreement. We received a $1 million upfront payment from Biotest upon execution of the agreement. We are also entitled to receive up to a total of $35.5 million in milestone payments, plus royalties on the commercial sales of any resulting products.

The agreement also provides us with the right to elect, at specific stages during the clinical evaluation of any compound created under the agreement, to participate in the United States development and commercialization of that compound in lieu of receiving the milestone payments not yet earned and royalties on sales in the United States. We can exercise this right during an exercise period specified in the agreement by notice and payment to Biotest of an agreed upon opt-in fee of $5 million or $15 million, depending on the stage of development. Upon exercise of this right, we would share equally with Biotest the associated costs of product development and commercialization in the United States along with the profit, if any, from product sales in the United States.

Biotest may terminate the agreement for convenience at any time prior to our election to participate in the development and commercialization in the United States of a compound created under this agreement upon prior notice to us. The agreement may also be terminated by either party for a material breach by the other, subject to notice and cure provisions. Unless earlier terminated, the agreement will continue in effect until the expiration of Biotest's royalty obligations, which are determined on a product-by-product and country-by-country basis. For each product and country, Biotest's royalty obligations commence upon first commercial sale of that product in that country, and extend until the later of either the expiration of the last-to-expire ImmunoGen patent covering that product in that country or the expiration for that country of the minimum royalty period specified in the agreement.

Through March 31, 2012, we have earned and received a total of $500,000 in milestone payments under this agreement.

Bayer HealthCare

In October 2008, we granted Bayer HealthCare an exclusive development and commercialization license to our maytansinoid TAP technology for use with antibodies or other proteins that target mesothelin. The product candidate BAY 94-9343 is currently in development under this agreement. We received a $4 million upfront payment upon execution of the agreement. We are also entitled to receive, for each product developed and marketed by Bayer HealthCare under this agreement, up to a total of $170.5 million in milestone payments, plus royalties on the commercial sales of any resulting products.

Bayer HealthCare may terminate the agreement for convenience at any time upon prior written notice to us. The agreement may also be terminated by either party for a material breach by the other, subject to notice and cure provisions. We may also terminate the agreement upon the occurrence of specified events. Unless earlier terminated, the agreement will continue in effect until the expiration of Bayer HealthCare's royalty obligations, which are determined on a product-by-product and country-by-country basis. For each product and country, Bayer HealthCare's royalty obligations commence upon first commercial sale of that product in that country, and extend until the later of either the expiration of the last-to-expire ImmunoGen patent covering that product in that country or the expiration for that country of the minimum royalty period specified in the agreement.

Through March 31, 2012, we have earned and received a total of $3 million in milestone payments under this agreement.

Table of Contents

Novartis

In October 2010, we entered into a right-to-test agreement with Novartis. The agreement provides Novartis with a right to (a) test our TAP technology with Novartis' antibodies directed to the optioned targets under a right-to-test, or research, license, (b) take exclusive options, with certain restrictions, to individual targets selected by Novartis for specified option periods, and (c) upon exercise of those options take exclusive licenses to use our TAP technology to develop and commercialize products for a specified number of individual targets on terms agreed upon at the inception of the right-to-test agreement. The initial term of the right-to-test agreement is three years, which may be extended by Novartis for up to two additional one-year periods by the payment of additional consideration. Novartis must exercise its options for the development and commercialization licenses by the end of the term of the right-to-test agreement, after which any then outstanding options will lapse.

We received a $45 million upfront payment in connection with the execution of the right-to-test agreement, and we are also entitled to receive additional payments under the agreement for research and development activities performed on behalf of Novartis during the term of the agreement. For each development and commercialization license taken, we are entitled to receive an exercise fee of $1 million and up to a total of $199.5 million in milestone payments, plus royalties on the commercial sales of any resulting products.

Novartis may terminate any development and commercialization license for convenience upon prior notice to us. Each license may also be terminated by either party for a material breach by the other, subject to notice and cure provisions. Unless earlier terminated, each development and commercialization license will continue in effect until the expiration of Novartis' royalty obligations, which are determined on a product-by-product and country-by-country basis. For each product and country, Novartis' royalty obligations commence upon first commercial sale of that product in that country, and extend until the later of either the expiration of the last-to-expire ImmunoGen patent covering that product in that country or the expiration for that country of the minimum royalty period specified in each license. No development and commercialization license has yet been taken under the right-to-test agreement.

Lilly

In December 2011, the Company entered into a three-year right-to-test agreement with Lilly. The agreement provides Lilly with the right to (a) take exclusive options, with certain restrictions, to individual targets selected by Lilly for specified option periods, (b) test our maytansinoid TAP technology with Lilly's antibodies directed to the optioned targets under a right-to-test, or research, license, and (c) upon exercise of those options take exclusive licenses to use our maytansinoid TAP technology to develop and commercialize products for a specified number of individual targets on terms agreed upon at the inception of the right-to-test agreement. Lilly must exercise its options for the development and commercialization licenses by the end of the term of the right-to-test agreement, after which any then outstanding options will lapse.

We received a $20 million upfront payment in connection with the execution of the agreement, and we are also entitled to receive additional payments under the agreement for research and development activities performed under the agreement on behalf of Lilly during the term of the research license. For the first development and commercialization license taken, we are entitled to receive up to a total of $200.5 million in milestone payments, plus royalties on the commercial sales of any resulting products. For each subsequent development and commercialization license taken, we are entitled to receive an exercise fee of $2 million and up to a total of $199 million in milestone payments, plus royalties on the commercial sales of any resulting products.

Lilly may terminate any development and commercialization license for convenience upon prior notice to us. Each license may also be terminated by either party for a material breach by the other,

Table of Contents

subject to notice and cure provisions. We may also terminate the agreement upon the occurrence of specified events. Unless earlier terminated, each development and commercialization license will continue in effect until the expiration of Lilly's royalty obligations, which are determined on a product-by-product and country-by-country basis. For each product and country, Lilly's royalty obligations commence upon first commercial sale of that product in that country, and extend until the later of either the expiration of the last-to-expire ImmunoGen patent covering that product in that country or the expiration for that country of the minimum royalty period specified in each license. No development and commercialization license has yet been taken under the right-to-test agreement.

Business Development

We believe our current portfolio of potent cell-killing agents and engineered linkers is highly competitive and we continue to conduct research to develop additional cell-killing agents and linkers to further strengthen our position in the field. As we go forward, we may also choose to partner individual product candidates, for example on a geographic basis. We believe our TAP technology and expanding portfolio of product candidates could provide additional opportunities for partnerships and collaborations.

Corporate Information

We were organized as a Massachusetts corporation in March 1981. Our principal offices are located at 830 Winter Street, Waltham, Massachusetts 02451, and our telephone number is (781) 895-0600. We maintain a web site at www.immunogen.com, where certain information about us is available. Please note that the information contained on the web site is not a part of this prospectus supplement.

Herceptin® is a registered trademark of Genentech, a member of the Roche Group. Rituxan® is a registered trademark of Biogen Idec Inc. Tykerb® is a registered trademark of GlaxoSmithKline plc. Xeloda® is a registered trademark of Roche. Mylotarg® is a registered trademark of Wyeth LLC. Other brands, names and trademarks contained in this prospectus supplement, the accompanying prospectus or the documents incorporated by reference herein and therein are the property of their respective owners.

Table of Contents

The Offering

Common stock offered by us	shares
Common stock to be outstanding after the offering	shares (or shares if the option to purchase additional shares is exercised in full)

Option to Purchase Additional Shares

We have granted the underwriters an option to purchase up to additional shares of our common stock. This option is exercisable, in whole or in part, for a period of 30 days from the date of this prospectus supplement.

Use of Proceeds

We intend to use the net proceeds from this offering for our operations, including, but not limited to, general corporate purposes, which may include research and development expenditures, clinical trial expenditures, manufacture and supply of drug substance and drug products, acquisitions of new technologies, capital expenditures and working capital. See "Use of Proceeds" on page S-21.

NASDAQ Global Select Market Listing

Our common stock is listed on The NASDAQ Global Select Market under the symbol "IMGN."

Risk Factors

An investment in our common stock involves a high degree of risk. See "Risk Factors" beginning on page S-17 of this prospectus supplement.

Outstanding Shares

The number of shares to be outstanding after this offering is based on 77,190,332 shares of common stock outstanding as of March 31, 2012. It does not include:

- 7,036,364 shares of our common stock issuable upon exercise of stock options outstanding as of March 31, 2012 under our stock option plans as of that date, at a weighted average exercise price of $8.67;
- 250,345 shares of our common stock issuable upon redemption of deferred stock units by non-employee directors as of March 31, 2012; and
- 3,111,213 shares of our common stock available as of March 31, 2012 for future grant or issuance pursuant to our stock-based plans for employees, directors and consultants.

Unless otherwise indicated, all information in this prospectus supplement assumes that the underwriters will not exercise the option to purchase additional shares granted to them by us.

Table of Contents

Risk Factors

An investment in our common stock involves a high degree of risk. Before deciding whether to invest in our common stock, you should consider carefully the risks described below and discussed under the section captioned "Risk Factors" contained in our Annual Report on Form 10-K for the year ended June 30, 2011, as filed with the SEC on August 29, 2011, and our Quarterly Reports for the quarters ended September 30, 2011, December 31, 2011 and March 31, 2012, filed with the SEC on October 31, 2011, January 31, 2012 and May 10, 2012, respectively, which are incorporated by reference in the prospectus supplement and the accompanying prospectus in their entirety, together with other information in this prospectus supplement, the accompanying prospectus, the information and documents incorporated by reference, and in any free writing prospectus that we have authorized for use in connection with this offering. If any of these risks actually occurs, our business, financial condition, results of operation or cash flow could be seriously harmed. This could cause the trading price of our common stock to decline, resulting in a loss of all or part of your investment.

Risks Related to This Offering

We may allocate the net proceeds from this offering in ways that you and other shareholders may not approve.

We intend to use the net proceeds from this offering for general corporate purposes, which may include:

- research and development expenditures;
- clinical trial expenditures;
- manufacture and supply of drug substance and drug products;
- acquisitions of new technologies, including through in-licensing or collaborations;
- capital expenditures; and
- working capital.

Our management will have broad discretion as to the application of these net proceeds and could use them for purposes other than those contemplated at the time of this offering. In addition, if our management decides to invest all or part of the net proceeds of this offering, such investments may lose all or part of their valve. Our shareholders may not agree with the manner in which our management chooses to allocate and spend the net proceeds from this offering and our management could spend the net proceeds in ways that do not necessarily improve our operating results or enhance the value of our common stock.

You will experience immediate dilution in the book value per share of the common stock you purchase.

Because the price per share of our common stock being offered is substantially higher than the book value per share of our common stock, you will suffer substantial dilution in the net tangible book value of the common stock you purchase in this offering. After giving effect to the sale by us of shares of common stock in this offering, and based on the public offering price of $ per share in this offering, less the underwriting discounts and commissions and estimated offering expenses payable by us, and a net tangible book value per share of our common stock of $1.31 as of March 31, 2012, if you purchase shares of common stock in this offering, you will suffer immediate and substantial dilution of $ per share in the as adjusted net tangible book value of our common stock. If the underwriters exercise their option to purchase additional shares you will experience additional dilution. See "Dilution" on page S-22 for a more detailed discussion of the dilution you will incur in connection with this offering.

Table of Contents

In addition, we have a significant number of stock options and deferred stock units. To the extent that outstanding stock options have been or may be exercised, outstanding deferred stock units are settled, or other securities are issued, investors purchasing our common stock in this offering may experience further dilution. In addition, we may choose to raise additional capital due to market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. To the extent that additional capital is raised through the sale of equity or convertible debt securities, the issuance of these securities could result in further dilution to our shareholders or result in downward pressure on the price of our common stock.

Table of Contents

Special Note Regarding Forward-Looking Statements

This prospectus supplement, the accompanying prospectus and the documents incorporated by reference herein and therein contain forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. These statements relate to future events and our future financial performance.

These forward-looking statements are identified by their use of terms and phrases, such as "anticipate," "believe," "could," "estimate," "expect," "intend," "may," "plan," "predict," "project," "will," "tracking" and other similar terms and phrases, including references to assumptions. These statements are contained in the "Risk Factors" section, as well as other sections of this prospectus supplement.

Forward-looking statements in this prospectus supplement include, but are not limited to:

- our and our collaborators' expectations regarding clinical trials, development timelines, regulatory filings and market potential for, IMGN901, IMGN529, IMGN853, T-DM1, SAR3419, SAR650984, SAR566658, BT-062, BAY 94-9343, *Amgen 1, Amgen 2* and other drug candidates in research or under development by us and our collaborators;

- Roche's plans to submit a marketing application to the Food and Drug Administration, or FDA, for T-DM1 for the treatment of second-line and later HER2+ metastatic breast cancer in the United States;

- our beliefs regarding the timing of Roche receiving marketing approval for T-DM1 and the timing of our potential receipt of royalties on sales of T-DM1 thereafter;

- Roche's expectations regarding receiving trial results and interim data relating to trials for T-DM1;

- Roche's expectation regarding commencement of, and reporting data from, additional clinical trials, including in the neoadjuvant, adjuvant and residual invasive disease settings;

- expectations regarding Roche's ability to file a marketing application for T-DM1 as second-line treatment in HER2+ metastatic breast cancer with the FDA and in the European Union during 2012 and Japan in 2013 and as a first-line treatment in 2014;

- our belief that T-DM1 has the potential to be a valuable new pharmaceutical for the treatment of patients with HER2+ metastatic breast cancer and that IMGN901 has the potential to be the first effective antibody-based therapy for certain targeted cancers;

- our plans relating to clinical trial timing, clinical trial design and the route to market for IMGN901, IMGN529 and IMGN853;

- our expectations regarding reporting interim data from one or more of our clinical trials of IMGN901, IMGN529 and IMGN853;

- our expectations and those of our collaboration partners to report data on ongoing clinical trials with respect to our other product candidates at medical conferences and other venues through 2012 and 2013;

our expectations regarding the advancement of up to three compounds, in development through our collaborations, into pivotal testing by the end of 2013;

our expectation to submit an IND for our fourth wholly owned compound in mid-2013;

our expectations regarding the potential uses of our TAP technology in enabling effective antibody-based therapies to be developed for many more types of cancers and our ability to conduct numerous clinical trials for existing and new product candidates in the future;

Table of Contents

- our expectations regarding the incidences of various diseases in 2012;
- our expectations regarding our operating and capital requirements;
- our expectation of the amount and timing of future revenues, potential development, clinical and regulatory milestones, expenses, dividends, investments and other items affecting the results of our operations; and
- our expected uses of the net proceeds from this offering.

These forward-looking statements involve known and unknown risks, uncertainties and other factors that may cause actual results to be materially different from those contemplated by our forward-looking statements. These known and unknown risks, uncertainties and other factors are described in detail in the "Risk Factors" section and in other sections of this prospectus supplement and our Annual Report on Form 10-K for the fiscal year ended June 30, 2011 and our subsequent Quarterly Reports on Form 10-Q. We disclaim any intention or obligation to update or revise any forward-looking statements, whether as a result of new information, future events or otherwise.

Table of Contents

Use of Proceeds

We estimate that the net proceeds we will receive from this offering, based on the public offering price of $ per share, will be approximately $ million, after deducting the underwriting discounts and commissions and estimated offering expenses payable by us, or approximately $ million if the underwriters exercise their option to purchase additional shares in full.

We intend to use the net proceeds from this offering for our operations, including, but not limited to, general corporate purposes, which may include research and development expenditures, clinical trial expenditures, manufacture and supply of drug substance and drug products, acquisitions of new technologies, capital expenditures and working capital.

We have not determined the amounts we plan to spend on any of the areas listed above or the timing of these expenditures. The amounts and timing of these expenditures will depend on a number of factors, such as whether and when we receive any regulatory approvals for our product candidates, our ability to enter into additional collaboration, licensing or similar transactions, the timing and progress of our research and development efforts, technological advances and the competitive environment for our product candidates. As a result, our management will have broad discretion to allocate the net proceeds from this offering. We have no current plans, commitments or agreements with respect to any acquisitions and may not make any acquisitions. Pending application of the net proceeds as described above, we intend to invest the net proceeds of the offering in short-term, investment-grade, interest-bearing securities.

Table of Contents

Dilution

If you purchase our common stock in this offering, your interest will be diluted to the extent of the difference between the public offering price per share and the net tangible book value per share of our common stock after this offering. We calculate net tangible book value per share by subtracting our total liabilities from our total tangible assets and dividing the difference by the number of outstanding shares of our common stock. Total tangible assets excludes deferred debt costs included in other assets on our condensed consolidated balance sheets at March 31, 2012.

Our net tangible book value at March 31, 2012 was $100.9 million, or $1.31 per share, based on 77.2 million shares of our common stock outstanding as of that date. After giving effect to the sale of shares of common stock by us at the public offering price of $ per share, less the underwriting discounts and commissions and estimated offering expenses payable by us, our as adjusted net tangible book value at March 31, 2012 would have been $ million, or $ per share. This represents an immediate increase in the as adjusted net tangible book value of $ per share to existing shareholders and an immediate dilution of $ per share to investors in this offering. The following table illustrates this per share dilution:

Public offering price per share		$
Net tangible book value per share as of March 31, 2012	$1.31	
Increase in net tangible book value per share attributable to new investors purchasing shares in this offering	$	
As adjusted net tangible book value per share after this offering		$
Dilution per share to new investors purchasing shares in this offering		$

If the underwriters exercise their option to purchase additional shares in full, the as adjusted net tangible book value would increase to approximately $ million, or $ per share, representing an increase in net tangible book value per share to existing shareholders of approximately $ per share, and there would be an immediate dilution of approximately $ per share to new investors.

The above discussion and table are based on 77,190,332 shares of common stock outstanding as of March 31, 2012 and do not include:

- 7,036,364 shares of our common stock issuable upon exercise of stock options outstanding as of March 31, 2012 under our stock option plans as of that date, at a weighted average exercise price of $8.67;
- 250,345 shares of our common stock issuable upon redemption of deferred stock units by non-employee directors as of March 31, 2012; and
- 3,111,213 shares of our common stock available as of March 31, 2012 for future grant or issuance pursuant to our stock-based plans for employees, directors and consultants.

To the extent that outstanding options are exercised or outstanding deferred stock units are settled, you will experience further dilution. In addition, we may choose to raise additional capital due to market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. To the extent that additional capital is raised through the sale of equity or convertible debt securities, the issuance of these securities could result in further dilution to our shareholders.

Table of Contents

Price Range of Common Stock

Our common stock is listed on The NASDAQ Global Select Market under the symbol "IMGN." The last reported sale price for our common stock on July 10, 2012 was $17.37 per share. The table below sets forth closing information on the range of high and low closing prices for our common stock during the periods indicated.

	High	Low
Fiscal Year ended June 30, 2010		
First Quarter	$ 9.99	$ 7.14
Second Quarter	8.89	6.69
Third Quarter	8.27	6.35
Fourth Quarter	10.46	7.79
Fiscal Year ended June 30, 2011		
First Quarter	$ 9.77	$ 5.16
Second Quarter	9.94	6.24
Third Quarter	9.85	8.26
Fourth Quarter	13.58	8.98
Fiscal Year ended June 30, 2012		
First Quarter	$ 15.55	$ 9.42
Second Quarter	14.44	10.09
Third Quarter	14.61	11.38
Fourth Quarter	16.74	12.22
Fiscal Year ended June 30, 2013		
First Quarter (through July 10, 2011)	$ 17.97	$ 17.37

Table of Contents

Dividend Policy

We have never declared or paid any cash dividends on our common stock, and we currently expect that future earnings, if any, will be retained for use in our business. Accordingly, we do not expect to pay cash dividends on our common stock in the foreseeable future.

Table of Contents

Underwriting

Under the terms and subject to the conditions in an underwriting agreement dated the date of this prospectus supplement, the underwriters named below, for whom Morgan Stanley & Co. LLC and Jefferies & Company, Inc. are acting as representatives, have severally agreed to purchase, and we have agreed to sell to them, severally, the number of shares indicated below:

Name	Number of Shares
Morgan Stanley & Co. LLC	
Jefferies & Company, Inc.	
Total	

The underwriters and the representatives are collectively referred to as the "underwriters" and the "representatives," respectively. The underwriters are offering the shares of common stock subject to their acceptance of the shares from us and subject to prior sale. The underwriting agreement provides that the obligations of the several underwriters to pay for and accept delivery of the shares of common stock offered by this prospectus supplement are subject to the approval of certain legal matters by their counsel and to certain other conditions. The underwriters are obligated to take and pay for all of the shares of common stock offered by this prospectus supplement if any such shares are taken. However, the underwriters are not required to take or pay for the shares covered by the underwriters' option to purchase additional shares described below.

The underwriters initially propose to offer part of the shares of common stock directly to the public at the offering price listed on the cover page of this prospectus supplement and part to certain dealers. After the initial offering of the shares of common stock, the offering price and other selling terms may from time to time be varied by the representatives.

We have granted to the underwriters an option, exercisable for 30 days from the date of this prospectus supplement, to purchase up to additional shares of common stock at the public offering price listed on the cover page of this prospectus supplement, less underwriting discounts and commissions. To the extent the option is exercised, each underwriter will become obligated, subject to certain conditions, to purchase about the same percentage of the additional shares of common stock as the number listed next to the underwriter's name in the preceding table bears to the total number of shares of common stock listed next to the names of all underwriters in the preceding table.

The following table shows the per share and total public offering price, underwriting discounts and commissions, and proceeds before expenses to us. These amounts are shown assuming both no exercise and full exercise of the underwriters' option to purchase up to an additional shares of common stock.

	Per Share	Total	
		No Exercise	Full Exercise
Public offering price	$	$	$
Underwriting discounts and commissions to be paid by us:	$	$	$
Proceeds, before expenses, to us	$	$	$

The estimated offering expenses payable by us, exclusive of the underwriting discounts and commissions, are approximately $315,000.

Our common stock is listed on the NASDAQ Global Select Market under the trading symbol "IMGN".

Table of Contents

We and all of our directors and officers have agreed that, without the prior written consent of Morgan Stanley & Co. LLC and Jefferies & Company, Inc. on behalf of the underwriters, we and they will not, during the period ending 90 days after the date of this prospectus supplement (the "restricted period"):

- offer, pledge, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase or otherwise transfer or dispose of, directly or indirectly, any shares of common stock or any securities convertible into or exercisable or exchangeable for shares of common stock;

- file any registration statement with the SEC relating to the offering of any shares of common stock or any securities convertible into or exercisable or exchangeable for common stock; or

- enter into any swap or other arrangement that transfers to another, in whole or in part, any of the economic consequences of ownership of the common stock;

whether any such transaction described above is to be settled by delivery of common stock or such other securities, in cash or otherwise. In addition, we and each such person agrees that, without the prior written consent of Morgan Stanley & Co. LLC and Jefferies & Company, Inc. on behalf of the underwriters, we or such other person will not, during the restricted period, make any demand for, or exercise any right with respect to, the registration of any shares of common stock or any security convertible into or exercisable or exchangeable for common stock.

The restrictions described in the immediately preceding paragraph to do not apply to, among other things:

- the sale of shares to the underwriters; or

- the issuance by us of shares of common stock upon the exercise of an option or the conversion of a security outstanding on the date of this prospectus supplement;

- the establishment of a trading plan pursuant to Rule 10b5-1 under the Securities Exchange Act of 1934, as amended, or a 10b5-1 Plan, for the transfer of shares of common stock, provided that such 10b5-1 Plan does not provide for the transfer of shares of common stock during the restricted period and no public announcement or filing under the Securities Exchange Act of 1934, as amended, regarding the establishment of such 10b5-1 Plan shall be required or shall be voluntarily made; or

- the transfer or sale of common stock under an existing 10b5-1 Plan.

The restricted period described in the preceding paragraph will be extended if:

- during the last 17 days of the restricted period we issue an earnings release or material news or a material event relating to us occurs; or

- prior to the expiration of the restricted period, we announce that we will release earnings results during the 16-day period beginning on the last day of the restricted period;

in which case the restrictions described in the preceding paragraph will continue to apply until the expiration of the 18-day period beginning on the issuance of the earnings release or material news or the occurrence of the material event.

In order to facilitate the offering of the common stock, the underwriters may engage in transactions that stabilize, maintain or otherwise affect the price of the common stock. Specifically, the underwriters may sell more shares than they are obligated to purchase under the underwriting agreement, creating a short position. A short sale is covered if the short position is no greater than the number of shares available for purchase by the underwriters under the option. The underwriters can close out a covered short sale by exercising the option or purchasing

shares in the open market. In

Table of Contents

determining the source of shares to close out a covered short sale, the underwriters will consider, among other things, the open market price of shares compared to the price available under the option. The underwriters may also sell shares in excess of the option, creating a naked short position. The underwriters must close out any naked short position by purchasing shares in the open market. A naked short position is more likely to be created if the underwriters are concerned that there may be downward pressure on the price of the common stock in the open market after pricing that could adversely affect investors who purchase in this offering. As an additional means of facilitating this offering, the underwriters may bid for, and purchase, shares of common stock in the open market to stabilize the price of the common stock. These activities may raise or maintain the market price of the common stock above independent market levels or prevent or retard a decline in the market price of the common stock. The underwriters are not required to engage in these activities and may end any of these activities at any time.

We and the underwriters have agreed to indemnify each other against certain liabilities, including liabilities under the Securities Act of 1933, as amended.

A prospectus supplement in electronic format may be made available on websites maintained by one or more underwriters participating in this offering. The representatives may agree to allocate a number of shares of common stock to underwriters for sale to their online brokerage account holders. Internet distributions will be allocated by the representatives to underwriters that may make Internet distributions on the same basis as other allocations.

Selling Restrictions

European Economic Area

In relation to each Member State of the European Economic Area which has implemented the Prospectus Directive (each, a "Relevant Member State") an offer to the public of any shares of our common stock may not be made in that Relevant Member State, except that an offer to the public in that Relevant Member State of any shares of our common stock may be made at any time under the following exemptions under the Prospectus Directive, if they have been implemented in that Relevant Member State:

(a) to any legal entity which is a qualified investor as defined in the Prospectus Directive;

(b) to fewer than 100 or, if the Relevant Member State has implemented the relevant provision of the 2010 PD Amending Directive, 150, natural or legal persons (other than qualified investors as defined in the Prospectus Directive), as permitted under the Prospectus Directive, subject to obtaining the prior consent of the representatives for any such offer; or

(c) in any other circumstances falling within Article 3(2) of the Prospectus Directive, provided that no such offer of shares of our common stock shall result in a requirement for the publication by us or any underwriter of a prospectus pursuant to Article 3 of the Prospectus Directive.

For the purposes of this provision, the expression an "offer to the public" in relation to any shares of our common stock in any Relevant Member State means the communication in any form and by any means of sufficient information on the terms of the offer and any shares of our common stock to be offered so as to enable an investor to decide to purchase any shares of our common stock, as the same may be varied in that Member State by any measure implementing the Prospectus Directive in that Member State, the expression "Prospectus Directive" means Directive 2003/71/EC (and amendments thereto, including the 2010 PD Amending Directive, to the extent implemented in the Relevant Member State), and includes any relevant implementing measure in the Relevant Member State, and the expression "2010 PD Amending Directive" means Directive 2010/73/EU.

Table of Contents

United Kingdom

Each underwriter has represented and agreed that:

(a) it has only communicated or caused to be communicated and will only communicate or cause to be communicated an invitation or inducement to engage in investment activity (within the meaning of Section 21 of the FSMA) received by it in connection with the issue or sale of the shares of our common stock in circumstances in which Section 21(1) of the FSMA does not apply to us; and

(b) it has complied and will comply with all applicable provisions of the FSMA with respect to anything done by it in relation to the shares of our common stock in, from or otherwise involving the United Kingdom.

Table of Contents

Legal Matters

The validity of the shares of common stock offered hereby will be passed upon for us by Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., Boston, Massachusetts. Latham & Watkins LLP will act as counsel to the underwriters in connection with this offering.

Experts

The consolidated financial statements of ImmunoGen, Inc. appearing in ImmunoGen, Inc.'s Annual Report (Form 10-K) for the year ended June 30, 2011 (including the schedule appearing therein), and the effectiveness of ImmunoGen, Inc.'s internal control over financial reporting as of June 30, 2011 have been audited by Ernst & Young LLP, independent registered public accounting firm, as set forth in their reports thereon, included therein, and incorporated herein by reference. Such consolidated financial statements and schedule are incorporated herein by reference in reliance upon such reports given on the authority of such firm as experts in accounting and auditing.

Where You Can Find More Information

We are subject to the reporting requirements of the Securities Exchange Act of 1934, as amended, and file annual, quarterly and current reports, proxy statements and other information with the SEC. You may read and copy these reports, proxy statements and other information at the SEC's public reference facilities at 100 F Street, N.E., Room 1580, Washington, D.C. 20549. You can request copies of these documents by writing to the SEC and paying a fee for the copying cost. Please call the SEC at 1-800-SEC-0330 for more information about the operation of the public reference facilities. SEC filings are also available at the SEC's web site at *http://www.sec.gov*.

This prospectus supplement and the accompanying prospectus are only part of a registration statement on Form S-3 that we have filed with the SEC under the Securities Act of 1933, as amended, and therefore omit certain information contained in the registration statement. We have also filed exhibits and schedules with the registration statement that are excluded from this prospectus supplement, and you should refer to the applicable exhibit or schedule for a complete description of any statement referring to any contract or other document. You may inspect a copy of the registration statement, including the exhibits and schedules, without charge, at the public reference room or obtain a copy from the SEC upon payment of the fees prescribed by the SEC.

We also maintain a web site at *www.immunogen.com*, through which you can access our SEC filings. The information set forth on our web site is not part of this prospectus supplement.

Incorporation of Documents by Reference

The SEC allows us to "incorporate by reference" information from other documents that we file with them, which means that we can disclose important information in this prospectus supplement by referring to those documents. The information incorporated by reference is considered to be part of this prospectus supplement, and information that we file later with the SEC will automatically update and supersede the information in this prospectus supplement. We incorporate by reference the following documents (unless otherwise noted, the SEC file number for each of the documents listed below is 000-17999):

our Annual Report on Form 10-K, for the fiscal year ended June 30, 2011, filed with the SEC on August 29, 2011;

our Quarterly Report on Form 10-Q, for the quarterly period ended September 30, 2011, filed with the SEC on October 31, 2011;

Table of Contents

our Quarterly Report on Form 10-Q, for the quarterly period ended December 31, 2011, filed with the SEC on January 31, 2012;

our Quarterly Report on Form 10-Q, for the quarterly period ended March 31, 2012, filed with the SEC on May 10, 2012;

our Current Report on Form 8-K filed with the SEC on July 28, 2011;

our Current Report on Form 8-K filed with the SEC on September 26, 2011;

our Current Report on Form 8-K filed with the SEC on November 9, 2011;

our Current Report on Form 8-K filed with the SEC on February 2, 2012;

our Current Report on Form 8-K filed with the SEC on June 19, 2012;

the portions of our Definitive Proxy Statement on Schedule 14A that are deemed "filed" with the SEC under the Securities Exchange Act of 1934, as amended, filed on September 26, 2011;

the description of our capital stock contained in our Registration Statement on Form 8-A, filed on September 25, 1989, as amended by Amendment No. 1 thereto, filed on November 15, 1989, under the Securities Exchange Act of 1934, as amended, including amendments or reports filed for the purpose of updating such description; and

all reports and other documents subsequently filed by us pursuant to Sections 13(a), 13(c), 14 and 15(d) of the Securities Exchange Act of 1934, as amended, after the date of this prospectus supplement and prior to the termination of this offering (except for information contained in any such filing where we indicate that such information is being furnished and/or is not considered "filed" under the Securities Exchange Act of 1934, as amended) shall be deemed to be incorporated by reference in this prospectus supplement and to be a part hereof from the date of filing such reports and other documents.

We will provide without charge to each person, including any beneficial owner, to whom a copy of this prospectus supplement is delivered, upon the request of any such person, a copy of any or all of the information incorporated herein by reference (exclusive of exhibits to such documents unless such exhibits are specifically incorporated by reference herein). Requests, whether written or oral, for such copies should be directed to ImmunoGen, Inc., Attention: Investor Relations, 830 Winter Street, Waltham, Massachusetts 02451, (781) 895-0600.

Table of Contents

PROSPECTUS

COMMON STOCK
PREFERRED STOCK
DEBT SECURITIES
WARRANTS
UNITS

This prospectus will allow us to issue, from time to time at prices and on terms to be determined at or prior to the time of the offering, any combination of the securities in this prospectus, either individually or in units. We may also offer common stock or preferred stock upon conversion of the debt securities, common stock upon conversion of the preferred stock, or common stock, preferred stock or debt securities upon the exercise of warrants. In addition, this prospectus may be used to offer securities for the account of persons other than us. We will provide you with specific terms of any offering in one or more supplements to this prospectus. This prospectus may not be used to offer or sell our securities unless accompanied by a prospectus supplement. You should read this prospectus and any prospectus supplement, as well as any documents incorporated by reference into this prospectus or any prospectus supplement, carefully before you invest.

Our common stock is listed on The NASDAQ Global Select Market under the symbol "IMGN." On May 18, 2011, the last reported sale price of our common stock was $13.06 per share. Prospective purchasers of our securities are urged to obtain current information as to the market prices of our securities, where applicable.

Investing in our securities involves a high degree of risk. Before deciding whether to invest in our securities, you should consider carefully the risks that we have described on page 3 of this prospectus under the caption "Risk Factors." We may include specific risk factors in supplements to this prospectus under the caption "Risk Factors."

Our securities may be sold directly to investors, through agents designated from time to time or to or through underwriters or dealers. If any underwriters are involved in the sale of our securities with respect to which this prospectus is being delivered, the names of such underwriters and any applicable commissions or discounts and over-allotment options will be set forth in a prospectus supplement. The price to the public of such securities and the net proceeds that we expect to receive from such sale will also be set forth in a prospectus supplement.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

The date of this prospectus is May 19, 2011.

TABLE OF CONTENTS

Table of Contents

ABOUT THIS PROSPECTUS

This prospectus is part of a registration statement that we filed with the Securities and Exchange Commission, or SEC, utilizing a "shelf" registration process. Under this shelf registration process, shares of our common stock and preferred stock, various series of debt securities and/or warrants to purchase any of such securities, either individually or in units, may be offered in one or more offerings. This prospectus provides you with a general description of the securities that may be offered. Each time a type or series of securities is offered under this prospectus, we will provide a prospectus supplement that will contain specific information about the terms of that offering.

This prospectus does not contain all of the information included in the registration statement. For a more complete understanding of the offering of the securities, you should refer to the registration statement, including its exhibits. The prospectus supplement may also add, update or change information contained or incorporated by reference in this prospectus. However, no prospectus supplement will offer a security that is not registered and described in this prospectus. This prospectus, together with the applicable prospectus supplements and the documents incorporated by reference into this prospectus, includes all material information relating to this offering. You should carefully read this prospectus, the applicable prospectus supplements, the information and documents incorporated herein and therein by reference and the additional information under the heading "Where You Can Find More Information" before making an investment decision.

You should rely only on the information we have provided or incorporated by reference in this prospectus or any prospectus supplement. We have not authorized anyone to provide you with information different from that contained or incorporated by reference in this prospectus or any applicable prospectus supplement. No dealer, salesperson or other person is authorized to give any information or to represent anything not contained or incorporated by reference in this prospectus or any applicable prospectus supplement. You must not rely on any unauthorized information or representation. This prospectus is an offer to sell only the securities offered hereby, but only under circumstances and in jurisdictions where it is lawful to do so. You should assume that the information in this prospectus or any prospectus supplement is accurate only as of the date on the front of the document and that any information we have incorporated herein and therein by reference is accurate only as of the date of the document incorporated by reference, regardless of the time of delivery of this prospectus or any applicable prospectus supplement or any sale of a security.

We further note that the representations, warranties and covenants made by us in any agreement that is filed as an exhibit to any document that is incorporated by reference in this prospectus or any applicable prospectus supplement were made solely for the benefit of the parties to such agreement, including, in some cases, for the purpose of allocating risk among the parties to such agreements, and should not be deemed to be a representation, warranty or covenant to you. Moreover, such representations, warranties or covenants were accurate only as of the date when made. Accordingly, such representations, warranties and covenants should not be relied on as accurately representing the current state of our affairs.

This prospectus may not be used to consummate sales of our securities, unless it is accompanied by a prospectus supplement. To the extent there are inconsistencies between any prospectus supplement, this prospectus and any documents incorporated by reference, the document with the most recent date will control.

Unless the context otherwise requires, "ImmunoGen," "the Company," "we," "us," "our" and similar names refer to ImmunoGen, Inc. and our subsidiaries.

Table of Contents

PROSPECTUS SUMMARY

The following is a summary of our business and the offering of our securities under this prospectus. We urge you to read this entire prospectus, including the more detailed consolidated financial statements, notes to the consolidated financial statements and other information incorporated by reference from our other filings with the SEC or included in any applicable prospectus supplements. Investing in our securities involves risks. Therefore, carefully consider the risk factors in any prospectus supplements and in our most recent annual and quarterly filings with the SEC, as well as other information in this prospectus and any prospectus supplements and the documents incorporated by reference herein or therein, before purchasing our securities. Each of the risk factors could adversely affect our business, operating results and financial condition, as well as adversely affect the value of an investment in our securities.

About ImmunoGen, Inc.

Since our inception, we have been principally engaged in the development of novel, targeted therapeutics for the treatment of cancer using our expertise in cancer biology, manufactured antibodies, highly potent small-molecule cytotoxic, or cell-killing, agents and designing engineered linkers. Our Targeted Antibody Payload, or TAP, technology uses antibodies to deliver a potent cytotoxic agent specifically to targeted cancer cells to minimize damage to healthy tissue. A TAP compound consists of a tumor-targeting manufactured antibody with one of our proprietary cell-killing agents attached using one of our engineered linkers. The antibody component enables a TAP compound to bind specifically to cancer cells that express its target antigen, the highly potent cytotoxic agent serves to kill the cancer cell and the engineered linker controls the release of the cytotoxic agent inside the cancer cell. We use our expertise and proprietary technologies to develop targeted anticancer compounds for our own product pipeline. We also establish partnerships with other companies around our TAP technology and antibody expertise.

The most advanced TAP compound is trastuzumab emtansine, which is also known as T-DM1. T-DM1 is in advanced clinical testing for the treatment of HER2+ metastatic breast cancer through our collaboration with Genentech, Inc., a member of the Roche Group, which licensed the exclusive right to use certain of our cell-killing agents with antibodies that target HER2. Four other compounds SAR3419, SAR566658, SAR650984 and BT-062 are in early clinical testing through our collaborations with Sanofi (3) and Biotest AG (1), respectively. SAR650984 is a non-conjugated therapeutic, or "naked," antibody compound, and the other three drug candidates are TAP compounds.

Our lead wholly owned drug candidate is lorvotuzumab mertansine, or IMGN901, which is a TAP compound in early clinical testing for the treatment of CD56-expressing cancers, including small-cell lung cancer, Merkel cell carcinoma and multiple myeloma. Our earlier-stage drug candidate, IMGN388, is a TAP compound in initial clinical testing for the treatment of solid tumors. Our lead preclinical compounds are IMGN529 and IMGN853, which are potential new therapies for non-Hodgkin's lymphoma and for ovarian and other folate receptor 1-overexpressing cancers, respectively. We have additional targeted, antibody-based compounds in our research pipeline.

We were organized as a Massachusetts corporation in March 1981. Our principal offices are located at 830 Winter Street, Waltham, MA 02451, and our telephone number is (781) 895-0600. We maintain a web site at www.immunogen.com, where certain information about us is available. Please note that the information contained on the website is not a part of this prospectus.

Table of Contents

RISK FACTORS

Investing in our securities involves risk. The prospectus supplement applicable to each offering of our securities will contain a discussion of the risks applicable to an investment in us. Prior to making a decision about investing in our securities, you should carefully consider the specific factors discussed under the heading "Risk Factors" in the applicable prospectus supplement, together with all of the other information contained or incorporated by reference in the prospectus supplement or appearing or incorporated by reference in this prospectus. You should also consider the risks, uncertainties and assumptions discussed under the heading "Risk Factors" included in our most recent annual report on Form 10-K, which is on file with the SEC and is incorporated herein by reference, and which may be amended, supplemented or superseded from time to time by other reports we file with the SEC in the future. The risks and uncertainties we have described are not the only ones we face. Additional risks and uncertainties not presently known to us or that we currently deem immaterial may also affect our operations.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

The SEC encourages companies to disclose forward-looking information so that investors can better understand a company's future prospects and make informed investment decisions. This prospectus and the documents we have filed with the SEC that are incorporated herein by reference contain such "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995.

Words such as "may," "anticipate," "estimate," "expects," "projects," "intends," "plans," "believes," "tracking" and words and terms of similar substance used in connection with any discussion of future operating or financial performance, identify forward-looking statements. Forward-looking statements represent management's present judgment regarding future events and are subject to a number of risks and uncertainties that could cause actual results to differ materially from those described in the forward-looking statements. These risks include, but are not limited to, risks and uncertainties regarding our preclinical studies, our ability to conduct clinical trials of our product candidates and the results of such trials, as well as risks and uncertainties relating to litigation, government regulation and third-party reimbursement, economic conditions, markets, products, competition, intellectual property, services and prices, key employees, future capital needs, dependence on our collaborators and their ability to develop TAP compounds and other factors. Please also see the discussion of risks and uncertainties under "Risk Factors" contained in this prospectus and in any supplements to this prospectus and in our most recent annual report on Form 10-K, as revised or supplemented by subsequent quarterly reports on Form 10-Q, as well as any amendments thereto, as filed with the SEC and which are incorporated herein by reference.

In light of these assumptions, risks and uncertainties, the results and events discussed in the forward-looking statements contained in this prospectus or in any document incorporated herein by reference might not occur. Investors are cautioned not to place undue reliance on the forward-looking statements, which speak only as of the date of this prospectus or the date of the document incorporated by reference in this prospectus. We are not under any obligation, and we expressly disclaim any obligation, to update or alter any forward-looking statements, whether as a result of new information, future events or otherwise. All subsequent forward-looking statements attributable to us or to any person acting on our behalf are expressly qualified in their entirety by the cautionary statements contained or referred to in this section.

RATIO OF EARNINGS TO FIXED CHARGES

Any time debt securities are offered pursuant to this prospectus, we will provide a table setting forth our ratio of earnings to fixed charges on a historical basis in the applicable prospectus supplement, if required.

Table of Contents

USE OF PROCEEDS

Except as provided in the applicable prospectus supplement, we intend to use the net proceeds from the sale of the securities by us through this prospectus for general corporate purposes. Except as provided in the applicable prospectus supplement, we will not receive any proceeds in the event that securities are sold by a selling securityholder. Additional information on the use of net proceeds from the sale of securities covered by this prospectus may be set forth in the prospectus supplement relating to the specific offering.

DESCRIPTION OF COMMON STOCK

We are authorized to issue 100,000,000 shares of common stock, par value $.01 per share. On May 18, 2011, we had 68,450,675 shares of common stock outstanding and approximately 487 shareholders of record.

The following summary of certain provisions of our common stock does not purport to be complete. You should refer to our restated articles of organization and our amended and restated by-laws, both of which are included as exhibits to the registration statement we have filed with the SEC in connection with this offering. The summary below is also qualified by provisions of applicable law.

General

Holders of common stock are entitled to one vote for each share held of record on all matters submitted to a vote of the shareholders, and do not have cumulative voting rights. Subject to preferences that may be applicable to any outstanding shares of preferred stock, holders of common stock are entitled to receive ratably such dividends, if any, as may be declared from time to time by our board of directors out of funds legally available for dividend payments. All shares of common stock outstanding as of the date of this prospectus and, upon issuance and sale, all shares of common stock that we may offer pursuant to this prospectus, will be fully paid and nonassessable. The holders of common stock have no preferences or rights of conversion, exchange, pre-emption or other subscription rights. There are no redemption or sinking fund provisions applicable to the common stock. In the event of any liquidation, dissolution or winding-up of our affairs, holders of common stock will be entitled to share ratably in our assets that are remaining after payment or provision for payment of all of our debts and obligations and after liquidation payments to holders of outstanding shares of preferred stock, if any.

Transfer Agent and Registrar

As of the date of this prospectus, the transfer agent and registrar for our common stock is Mellon Investor Services, LLC. We expect that as of May 25, 2011, Broadridge Corporate Issuer Solutions, Inc. will be the transfer agent and registrar of our common stock.

The NASDAQ Global Select Market

Our common stock is listed for quotation on The NASDAQ Global Select Market under the symbol "IMGN." On May 18, 2011, the last reported sale price of our common stock was $13.06 per share.

Table of Contents

DESCRIPTION OF PREFERRED STOCK

We are authorized to issue 5,000,000 shares of preferred stock, par value $.01 per share. As of May 18, 2011, no shares of our preferred stock were issued and outstanding. The following summary of certain provisions of our preferred stock does not purport to be complete. You should refer to our restated articles of organization and our amended and restated by-laws, both of which are included as exhibits to the registration statement we have filed with the SEC in connection with this offering. The summary below is also qualified by provisions of applicable law.

General

Our board of directors may, without further action by our shareholders, from time to time, direct the issuance of shares of preferred stock in series and may, at the time of issuance, determine the rights, preferences and limitations of each series, including voting rights, dividend rights and redemption and liquidation preferences. Satisfaction of any dividend preferences of outstanding shares of preferred stock would reduce the amount of funds available for the payment of dividends on shares of our common stock. Holders of shares of preferred stock may be entitled to receive a preference payment in the event of any liquidation, dissolution or winding-up of our company before any payment is made to the holders of shares of our common stock. In some circumstances, the issuance of shares of preferred stock may render more difficult or tend to discourage a merger, tender offer or proxy contest, the assumption of control by a holder of a large block of our securities or the removal of incumbent management. Upon the affirmative vote of our board of directors, without shareholder approval, we may issue shares of preferred stock with voting and conversion rights which could adversely affect the holders of shares of our common stock.

If a specific series of preferred stock is offered under this prospectus, we will describe the terms of the preferred stock in the prospectus supplement for such offering and will file a copy of the certificate establishing the terms of the preferred stock with the SEC. To the extent required, this description will include:

- the title and stated value;
- the number of shares offered, the liquidation preference per share and the purchase price;
- the dividend rate(s), period(s) and/or payment date(s), or method(s) of calculation for such dividends;
- whether dividends will be cumulative or non-cumulative and, if cumulative, the date from which dividends will accumulate;
- the procedures for any auction and remarketing, if any;
- the provisions for a sinking fund, if any;
- the provisions for redemption, if applicable;
- any listing of the preferred stock on any securities exchange or market;
- whether the preferred stock will be convertible into our common stock, and, if applicable, the conversion price (or how it will be calculated) and conversion period;
- whether the preferred stock will be exchangeable into debt securities, and, if applicable, the exchange price (or how it will be calculated) and exchange period;

voting rights, if any, of the preferred stock;

a discussion of any material and/or special United States federal income tax considerations applicable to the preferred stock;

the relative ranking and preferences of the preferred stock as to dividend rights and rights upon liquidation, dissolution or winding up of the affairs of ImmunoGen; and

any material limitations on issuance of any class or series of preferred stock ranking senior to or on a parity with the series of preferred stock as to dividend rights and rights upon liquidation, dissolution or winding up of ImmunoGen.

Table of Contents

DESCRIPTION OF DEBT SECURITIES

The following description, together with the additional information we include in any applicable prospectus supplements, summarizes the material terms and provisions of the debt securities that may be offered under this prospectus. While the terms we have summarized below will apply generally to any future debt securities that may be offered pursuant to this prospectus, we will describe the particular terms of any debt securities that may be offered in more detail in the applicable prospectus supplement. If we so indicate in a prospectus supplement, the terms of any debt securities offered under that prospectus supplement may differ from the terms we describe below, and to the extent the terms set forth in a prospectus supplement differ from the terms described below, the terms set forth in the prospectus supplement shall control.

Under this prospectus, debt securities, which may be senior or subordinated, may be sold from time to time, in one or more offerings. We will issue any such senior debt securities under a senior indenture that we will enter into with a trustee to be named in the senior indenture. We will issue any such subordinated debt securities under a subordinated indenture, which we will enter into with a trustee to be named in the subordinated indenture. We have filed forms of these documents as exhibits to the registration statement, which includes this prospectus. We use the term "indentures" to refer to both the senior indenture and the subordinated indenture. The indentures will be qualified under the Trust Indenture Act of 1939, as in effect on the date of the indenture, or the Trust Indenture Act. We use the term "debenture trustee" to refer to either the trustee under the senior indenture or the trustee under the subordinated indenture, as applicable.

The following summaries of material provisions of the senior debt securities, the subordinated debt securities and the indentures are subject to, and qualified in their entirety by reference to, all the provisions of the indenture applicable to a particular series of debt securities.

General

Each indenture provides that debt securities may be issued from time to time in one or more series and may be denominated and payable in United States dollars or foreign currencies or units based on or relating to United States dollars or foreign currencies, including euros. Neither indenture limits the amount of debt securities that may be issued thereunder, and each indenture provides that the specific terms of any series of debt securities shall be set forth in, or determined pursuant to, an authorizing resolution and/or a supplemental indenture, if any, relating to such series.

We will describe in each prospectus supplement the following terms relating to a series of debt securities:

- the title;
- the aggregate principal amount and any limit on the amount that may be issued;
- the currency or units based on or relating to currencies in which debt securities of such series are denominated and the currency or units in which principal or interest or both will or may be payable;
- whether we will issue the series of debt securities in global form, the terms of any global securities and who the depositary will be;
- the maturity date and the date or dates on which principal will be payable;
- the interest rate, which may be fixed or variable, or the method for determining the rate and the date interest will begin to accrue, the date or dates interest will be payable and the record dates for interest payment dates or the method for determining such dates;

Table of Contents

whether or not the debt securities will be secured or unsecured, and the terms of any secured debt;

the terms of the subordination of any series of subordinated debt;

the place or places where payments will be payable;

our right, if any, to defer payment of interest and the maximum length of any such deferral period;

the date, if any, after which, and the price at which, we may, at our option, redeem the series of debt securities pursuant to any optional redemption provisions;

the date, if any, on which, and the price at which we are obligated, pursuant to any mandatory sinking fund provisions or otherwise, to redeem, or at the holder's option to purchase, the series of debt securities;

whether the indenture will restrict our ability to pay dividends, or will require us to maintain any asset ratios or reserves;

whether we will be restricted from incurring any additional indebtedness;

a discussion on any material or special United States federal income tax considerations applicable to a series of debt securities;

the denominations in which we will issue the series of debt securities, if other than denominations of $1,000 and any integral multiple thereof; and

any other specific terms, preferences, rights or limitations of, or restrictions on, the debt securities.

We may issue debt securities that provide for an amount less than their stated principal amount to be due and payable upon declaration of acceleration of their maturity pursuant to the terms of the indenture. We will provide you with information on the federal income tax considerations and other special considerations applicable to any of these debt securities in the applicable prospectus supplement.

Conversion or Exchange Rights

We will set forth in the prospectus supplement the terms, if any, on which a series of debt securities may be convertible into or exchangeable for our common stock or our other securities. We will include provisions as to whether conversion or exchange is mandatory, at the option of the holder or at our option. We may include provisions pursuant to which the number of shares of our common stock or our other securities that the holders of the series of debt securities receive would be subject to adjustment.

Consolidation, Merger or Sale; No Protection in Event of a Change of Control or Highly Leveraged Transaction

The indentures may not contain any covenant that restricts our ability to merge or consolidate, or sell, convey, transfer or otherwise dispose of all or substantially all of our assets. However, any successor to or acquirer of such assets will be required to assume all of our obligations under the indentures or the debt securities, as appropriate.

Unless we state otherwise in the applicable prospectus supplement, the debt securities will not contain any provisions that may afford holders of the debt securities protection in the event we have a change of control or in the event of a highly leveraged transaction (whether or not

such transaction results in a change of control), which could adversely affect holders of debt securities.

Table of Contents

Events of Default Under the Indenture

The following will be events of default under the indentures with respect to any series of debt securities that we may issue:

- if we fail to pay interest when due and our failure continues for 90 days and the time for payment has not been extended or deferred;
- if we fail to pay the principal, or premium, if any, when due and the time for payment has not been extended or delayed;
- if we fail to observe or perform any other covenant relating to such series contained in the debt securities of such series or the applicable indentures, other than a covenant specifically relating to and for the benefit of holders of another series of debt securities, and our failure continues for 90 days after we receive written notice from the debenture trustee or holders of not less than a majority in aggregate principal amount of the outstanding debt securities of the applicable series; and
- if specified events of bankruptcy, insolvency or reorganization occur as to us.

No event of default with respect to a particular series of debt securities (except as to certain events of bankruptcy, insolvency or reorganization) necessarily constitutes an event of default with respect to any other series of debt securities. The occurrence of an event of default may constitute an event of default under any bank credit agreements we may have in existence from time to time. In addition, the occurrence of certain events of default or an acceleration under the indenture may constitute an event of default under certain of our other indebtedness outstanding from time to time.

If an event of default with respect to debt securities of any series at the time outstanding occurs and is continuing, then the trustee or the holders of not less than a majority in principal amount of the outstanding debt securities of that series may, by a notice in writing to us (and to the debenture trustee if given by the holders), declare to be due and payable immediately the principal (or, if the debt securities of that series are discount securities, that portion of the principal amount as may be specified in the terms of that series) of and premium and accrued and unpaid interest, if any, on all debt securities of that series. Before a judgment or decree for payment of the money due has been obtained with respect to debt securities of any series, the holders of a majority in principal amount of the outstanding debt securities of that series (or, at a meeting of holders of such series at which a quorum is present, the holders of a majority in principal amount of the debt securities of such series represented at such meeting) may rescind and annul the acceleration if all events of default, other than the non-payment of accelerated principal, premium, if any, and interest, if any, with respect to debt securities of that series, have been cured or waived as provided in the applicable indenture (including payments or deposits in respect of principal, premium or interest that had become due other than as a result of such acceleration). We refer you to the prospectus supplement relating to any series of debt securities that are discount securities for the particular provisions relating to acceleration of a portion of the principal amount of such discount securities upon the occurrence of an event of default.

Subject to the terms of the indentures, if an event of default under an indenture shall occur and be continuing, the debenture trustee will be under no obligation to exercise any of its rights or powers under such indenture at the request or direction of any of the holders of the applicable series of debt securities, unless such holders have offered the debenture trustee reasonable indemnity. The holders of a majority in principal amount of the outstanding debt securities of any series will have the right to direct the time, method and place of conducting any proceeding for any remedy available to the

Table of Contents

debenture trustee or exercising any trust or power conferred on the debenture trustee, with respect to the debt securities of that series, provided that:

- the direction so given by the holder is not in conflict with any law or the applicable indenture; and
- subject to its duties under the Trust Indenture Act, the debenture trustee need not take any action that might involve it in personal liability or might be unduly prejudicial to the holders not involved in the proceeding.

A holder of the debt securities of any series will only have the right to institute a proceeding under the indentures or to appoint a receiver or trustee, or to seek other remedies if:

- the holder previously has given written notice to the debenture trustee of a continuing event of default with respect to that series;
- the holders of at least a majority in aggregate principal amount of the outstanding debt securities of that series have made written request, and such holders have offered reasonable indemnity to the debenture trustee to institute the proceeding as trustee; and
- the debenture trustee does not institute the proceeding, and does not receive from the holders of a majority in aggregate principal amount of the outstanding debt securities of that series (or at a meeting of holders of such series at which a quorum is present, the holders of a majority in principal amount of the debt securities of such series represented at such meeting) other conflicting directions within 60 days after the notice, request and offer.

These limitations will not apply to a suit instituted by a holder of debt securities if we default in the payment of the principal, premium, if any, or interest on, the debt securities.

We will periodically file statements with the applicable debenture trustee regarding our compliance with specified covenants in the applicable indenture.

Modification of Indenture; Waiver

The debenture trustee and we may change the applicable indenture without the consent of any holders with respect to specific matters, including:

- to fix any ambiguity, defect or inconsistency in the indenture; and
- to change anything that does not materially adversely affect the interests of any holder of debt securities of any series issued pursuant to such indenture.

In addition, under the indentures, the rights of holders of a series of debt securities may be changed by us and the debenture trustee with the written consent of the holders of at least a majority in aggregate principal amount of the outstanding debt securities of each series (or, at a meeting of holders of such series at which a quorum is present, the holders of a majority in principal amount of the debt securities of such series represented at such meeting) that is affected. However, the debenture trustee and we may make the following changes only with the consent of each holder of any outstanding debt securities affected:

- extending the fixed maturity of the series of debt securities;

reducing the principal amount, reducing the rate of or extending the time of payment of interest, or a premium payable upon the redemption of any debt securities;

reducing the principal amount of discount securities payable upon acceleration of maturity;

Table of Contents

making the principal of or premium or interest on any debt security payable in currency other than that stated in the debt security; or

reducing the percentage of debt securities, the holders of which are required to consent to any amendment or waiver.

Except for certain specified provisions, the holders of at least a majority in principal amount of the outstanding debt securities of any series (or, at a meeting of holders of such series at which a quorum is present, the holders of a majority in principal amount of the debt securities of such series represented at such meeting) may on behalf of the holders of all debt securities of that series waive our compliance with provisions of the indenture. The holders of a majority in principal amount of the outstanding debt securities of any series may on behalf of the holders of all the debt securities of such series waive any past default under the indenture with respect to that series and its consequences, except a default in the payment of the principal of, premium or any interest on any debt security of that series or in respect of a covenant or provision, which cannot be modified or amended without the consent of the holder of each outstanding debt security of the series affected; provided, however, that the holders of a majority in principal amount of the outstanding debt securities of any series may rescind an acceleration and its consequences, including any related payment default that resulted from the acceleration.

Discharge

Each indenture will provide that we can elect to be discharged from our obligations with respect to one or more series of debt securities, except for obligations to:

register the transfer or exchange of debt securities of the series;

replace stolen, lost or mutilated debt securities of the series;

maintain paying agencies;

hold monies for payment in trust;

compensate and indemnify the trustee; and

appoint any successor trustee.

In order to exercise our rights to be discharged with respect to a series, we will have to deposit with the trustee money or government obligations sufficient to pay all the principal of, any premium, if any, and interest on, the debt securities of the series on the dates payments are due.

Form, Exchange, and Transfer

We will issue the debt securities of each series only in fully registered form without coupons and, unless we otherwise specify in the applicable prospectus supplement, in denominations of $1,000 and any integral multiple thereof. The indentures provide that we may issue debt securities of a series in temporary or permanent global form and as book-entry securities that will be deposited with, or on behalf of, The Depository Trust Company or another depositary named by us and identified in a prospectus supplement with respect to that series.

At the option of the holder, subject to the terms of the indentures and the limitations applicable to global securities described in the applicable prospectus supplement, the holder of the debt securities of any series can exchange the debt securities for other debt securities of the same series, in any authorized denomination and of like tenor and aggregate principal amount.

Subject to the terms of the indentures and the limitations applicable to global securities set forth in the applicable prospectus supplement, holders of the debt securities may present the debt securities

10

Table of Contents

for exchange or for registration of transfer, duly endorsed or with the form of transfer endorsed thereon duly executed if so required by us or the security registrar, at the office of the security registrar or at the office of any transfer agent designated by us for this purpose. Unless otherwise provided in the debt securities that the holder presents for transfer or exchange or in the applicable indenture, we will make no service charge for any registration of transfer or exchange, but we may require payment of any taxes or other governmental charges.

We will name in the applicable prospectus supplement the security registrar, and any transfer agent in addition to the security registrar, that we initially designate for any debt securities. We may at any time designate additional transfer agents or rescind the designation of any transfer agent or approve a change in the office through which any transfer agent acts, except that we will be required to maintain a transfer agent in each place of payment for the debt securities of each series.

If we elect to redeem the debt securities of any series, we will not be required to:

- issue, register the transfer of, or exchange any debt securities of that series during a period beginning at the opening of business 15 days before the day of mailing of a notice of redemption of any debt securities that may be selected for redemption and ending at the close of business on the day of the mailing; or

- register the transfer of or exchange any debt securities so selected for redemption, in whole or in part, except the unredeemed portion of any debt securities we are redeeming in part.

Information Concerning the Debenture Trustee

The debenture trustee other than during the occurrence and continuance of an event of default under the applicable indenture, will undertake to perform only those duties as are specifically set forth in the applicable indenture. Upon an event of default under an indenture, the debenture trustee under such indenture must use the same degree of care as a prudent person would exercise or use in the conduct of his or her own affairs. Subject to this provision, the debenture trustee is under no obligation to exercise any of the powers given it by the indentures at the request of any holder of debt securities unless it is offered reasonable security and indemnity against the costs, expenses and liabilities that it might incur.

Payment and Paying Agents

Unless we indicate otherwise in the applicable prospectus supplement, on any interest payment date, we will pay the interest on any debt securities to the person in whose name such debt securities, or one or more predecessor securities, are registered at the close of business on the regular record date for the interest.

We will pay principal of and any premium and interest on the debt securities of a particular series at the office of the paying agents designated by us, except that unless we otherwise indicate in the applicable prospectus supplement, will we make interest payments by check which we will mail to the holder. Unless we otherwise indicate in a prospectus supplement, we will designate the corporate trust office of the debenture trustee in the City of New York as our sole paying agent for payments with respect to debt securities of each series. We will name in the applicable prospectus supplement any other paying agents that we initially designate for the debt securities of a particular series. We will maintain a paying agent in each place of payment for the debt securities of a particular series.

All money we pay to a paying agent or the debenture trustee for the payment of the principal of or any premium or interest on any debt securities which remains unclaimed at the end of two years after such principal, premium or interest has become due and payable will be repaid to us, and the holder of the security thereafter may look only to us for payment thereof.

Table of Contents

Governing Law

The indentures and the debt securities will be governed by and construed in accordance with the laws of the State of New York, except to the extent that the Trust Indenture Act is applicable.

Subordination of Subordinated Debt Securities

Our obligations pursuant to any subordinated debt securities will be unsecured and will be subordinate and junior in priority of payment to certain of our other indebtedness to the extent described in a prospectus supplement. The subordinated indenture does not limit the amount of senior indebtedness we may incur. It also does not limit us from issuing any other secured or unsecured debt.

DESCRIPTION OF WARRANTS

Warrants to purchase shares of our common stock, preferred stock and/or debt securities in one or more series together with other securities or separately may be offered, as described in the applicable prospectus supplement. Below is a description of certain general terms and provisions of the warrants that may be offered. Particular terms of the warrants will be described in the warrant agreements and the prospectus supplement to the warrants.

The applicable prospectus supplement will contain, where applicable, the following terms of and other information relating to the warrants:

- the specific designation and aggregate number of, and the price at which the warrants will be issued;
- the currency or currency units in which the offering price, if any, and the exercise price are payable;
- the designation, amount and terms of the securities purchasable upon exercise of the warrants;
- if applicable, the exercise price for shares of our common stock and the number of shares of common stock to be received upon exercise of the warrants;
- if applicable, the exercise price for shares of our preferred stock, the number of shares of preferred stock to be received upon exercise, and a description of that series of our preferred stock;
- if applicable, the exercise price for our debt securities, the amount of debt securities to be received upon exercise, and a description of that series of debt securities;
- the date on which the right to exercise the warrants will begin and the date on which that right will expire or, if you may not continuously exercise the warrants throughout that period, the specific date or dates on which you may exercise the warrants;
- whether the warrants will be issued in fully registered form or bearer form, in definitive or global form or in any combination of these forms, although, in any case, the form of a warrant included in a unit will correspond to the form of the unit and of any security included in that unit;
- any applicable material United States federal income tax consequences;

if applicable, the identity of the warrant agent for the warrants and of any other depositaries, execution or paying agents, transfer agents, registrars or other agents;

the proposed listing, if any, of the warrants or any securities purchasable upon exercise of the warrants on any securities exchange;

Table of Contents

if applicable, the date from and after which the warrants and the common stock, preferred stock and/or debt securities will be separately transferable;

if applicable, the minimum or maximum amount of the warrants that may be exercised at any one time;

information with respect to book-entry procedures, if any;

the anti-dilution provisions of the warrants, if any;

any redemption or call provisions of the warrants, if any;

whether the warrants are to be sold separately or with other securities as parts of units; and

any additional terms of the warrants, including terms, procedures and limitations relating to the exchange and exercise of the warrants.

DESCRIPTION OF UNITS

Units consisting of common stock, preferred stock, debt securities and/or warrants for the purchase of common stock, preferred stock and/or debt securities in one or more series may be offered. In this prospectus, we have summarized certain general features of the units. We urge you, however, to read the prospectus supplements related to the series of units being offered, as well as the unit agreements that contain the terms of the units. We will file as exhibits to an amendment to the registration statement of which this prospectus is a part, or will incorporate by reference from a current report on Form 8-K that we file with the SEC, as applicable, the form of unit agreement and any supplemental agreements that describe the terms of the series of units being offered before the issuance of the related series of units.

We may evidence each series of units by unit certificates that would issue under a separate agreement that we may enter into with a unit agent. Each unit agent, if one is appointed, will be a bank or trust company that we select. We will indicate the name and address of the unit agent, if one is appointed, in the applicable prospectus supplement relating to a particular series of units.

SELLING SECURITYHOLDERS

Selling securityholders are persons or entities that, directly or indirectly, have acquired or will from time to time acquire, securities in various private or other transactions. Such selling securityholders may be parties to registration rights agreements with us, or we otherwise may have agreed or will agree to register their securities for resale. The purchasers of our securities, as well as their transferees, pledges, donees or successors, all of whom we refer to as "selling securityholders," may from time to time offer and sell the securities pursuant to this prospectus and any applicable prospectus supplement. The applicable prospectus supplement will set forth the name of each of the selling securityholders and the number of shares of our common stock or other relevant securities beneficially owned by such selling securityholders that are covered by such prospectus supplement.

Table of Contents

CERTAIN PROVISIONS OF MASSACHUSETTS LAW AND OF THE COMPANY'S ARTICLES OF ORGANIZATION AND BY-LAWS

Anti-Takeover Provisions under Massachusetts law and our Massachusetts Articles of Organization and By-laws

Provisions of Massachusetts law and our restated articles of organization and amended and restated by-laws contain other provisions that are intended to enhance the likelihood of continuity and stability in the composition of the board of directors and which may have the effect of delaying, deferring or preventing a future takeover or change in control of our company unless such takeover or change in control is approved by our board of directors.

These provisions, summarized below, are expected to discourage coercive takeover practices and inadequate takeover bids. These provisions are also designed to encourage persons seeking to acquire control of us to first negotiate with our board of directors. We believe that the benefits of increased protection of our potential ability to negotiate with the proponent of an unfriendly or unsolicited proposal to acquire or restructure us outweigh the disadvantages of discouraging these proposals because negotiation of these proposals could result in an improvement of their terms.

Massachusetts statutory business combinations provisions. We are subject to Chapter 110F of the Massachusetts General Laws, an anti-takeover law. In general, this statute prohibits a publicly-held Massachusetts corporation from engaging in a "business combination" with an "interested stockholder" for a period of three years after the date of the transaction in which the person becomes an interested stockholder, unless (i) the interested stockholder obtains the approval of the board of directors prior to becoming an interested stockholder, (ii) the interested stockholder acquires 90% of the outstanding voting stock of the corporation (excluding shares held by certain affiliates of the corporation) at the time it becomes an interested stockholder, or (iii) the business combination is approved by both the board of directors and the holders of two-thirds of the outstanding voting stock of the corporation (excluding shares held by the interested stockholder). Generally, an "interested stockholder" is a person who, together with affiliates and associates, owns (or at any time within the prior three years did own) 5% or more of the outstanding voting stock of the corporation. A "business combination" includes a merger, a stock or asset sale, and certain other transactions resulting in a financial benefit to the interested shareholders.

Massachusetts General Laws Chapter 110D, entitled "Regulation of Control Share Acquisitions," in general provides that any shareholder of a company subject to this statute who acquires 20% or more of the outstanding voting stock of a company may not vote such stock unless the shareholders of the company so authorize. Although our amended and restated by-laws currently exclude us from this statute, the board of directors may amend our by-laws to subject us to this statute prospectively.

Chapter 110C of the Massachusetts General Laws requires the person commencing a takeover bid to file certain information with the Secretary of the Commonwealth and the target company and provides that a bidder who fails to disclose its intent to gain control over a target corporation prior to acquiring 5% of the target company's stock is precluded from making any takeover bid for a period of one year after crossing the 5% threshold.

Blank check preferred stock. Our restated article of organization allows our board of directors to issue shares of preferred stock without the approval of our shareholders, which is referred to as "blank check" preferred stock. The effects of such issuance, among other things, could include the dilution in the voting power of our common stock if the preferred stock has voting rights and the reduction or restriction in the rights of holders of our common stock to receive a payment in the event of any liquidation, dissolution or winding-up of our company. In some circumstances, the issuance of shares of preferred stock may render more difficult or expensive or tend to discourage a merger, tender offer or proxy contest, the assumption of control by a holder of a large block of our securities or the removal of

Table of Contents

incumbent management. In addition, the board of directors could also utilize the shares of preferred stock in order to adopt a shareholder rights plan, or "poison pill," which could have the effect of discouraging or delaying a takeover of the company.

Advance notice provisions for shareholder proposals and shareholder nominations of directors. Our amended and restated by-laws provide that, for nominations to the board of directors or for other business to be properly brought by a shareholder before a meeting of shareholders, the shareholder must first have given timely notice of the proposal in writing to our Secretary. For an annual meeting, a shareholder's notice generally must be delivered not less than 45 days nor more than 75 days prior to the anniversary of the mailing date of the proxy statement for the previous year's annual meeting. For special meetings called to elect directors, a shareholder's notice must generally be delivered not less than 60 days (or ten days after public disclosure of the meeting date if later) nor more than 90 days prior to the meeting. Detailed requirements as to the form of the notice and information required in the notice are specified in the amended and restated by-laws. If it is determined that business was not properly brought before a meeting in accordance with our amended and restated by-laws, such business will not be conducted at the meeting. Although our by-laws do not give our board of directors the power to approve or disapprove shareholder nominations of candidates or proposals regarding other business to be conducted at a special or annual meeting, our by-laws may have the effect of precluding the conduct of some business at a meeting if the proper procedures are not followed or may discourage or defer a potential acquirer from conducting a solicitation of proxies to elect its own slate of directors or otherwise attempting to obtain control of us.

Classified board of directors. Section 8.06(b) of the Massachusetts Business Corporation Act provides that unless a company decides otherwise, the terms of directors of a public Massachusetts company shall be staggered by dividing the directors into three groups, as nearly equal in number as possible, with only one group of directors being elected each year. Sections 8.06(d) and (e) of the Massachusetts Business Corporation Act provide that when directors are so classified, (i) shareholders may remove directors only for cause, (ii) the number of directors shall be fixed only by the vote of the board of directors, (iii) vacancies and newly created directorships shall be filled solely by the affirmative vote of a majority of the remaining directors and (iv) a decrease in the number of directors will not shorten the term of any incumbent director. Our board of directors opted out of this staggered board of directors requirement, and all of our directors currently serve for one-year terms and are elected annually. Under Section 8.06(c)(2) of the Massachusetts Business Corporation Act, our board of directors may opt into the staggered board of directors requirements of Section 8.06(b) and application of Sections 8.06(d) and (e). If the board of directors opts into this structure, these provisions are likely to increase the time required for shareholders to change the composition of the board of directors. For example, in general, at least two annual meetings would be necessary for shareholders to effect a change in a majority of the members of the board of directors. The provision for a classified board could prevent a party who acquires control of a large portion of our outstanding common stock from obtaining control of our board of directors until our second annual shareholders meeting following the date the acquirer obtains the stock interest. The classified board provision could have the effect of discouraging a potential acquirer from making a tender offer or otherwise attempting to obtain control of us and could increase the likelihood that incumbent directors will retain their positions.

Shareholder can only act by unanimous written consent and restrictions on who can call a special meeting of shareholders. Although our restated articles of organization and amended and restated by-laws allow our shareholders to act by written consent, such written consent must be signed by all shareholders entitled to vote on the matter approved. This significantly restricts the ability of our shareholders to act by written consent and essentially provides that our shareholders may only act at a duly called shareholders meeting. In addition, special meetings of the shareholders may be called only by our President, our board of directors and one or more shareholders holding at least 40% of our voting stock.

Table of Contents

Limitations on Liability and Indemnification of Officers and Directors

Our restated articles of organization and amended and restated by-laws limit the liability of our officers and directors to the fullest extent permitted by the Massachusetts Business Corporation Act and provides that we will indemnify them to the fullest extent permitted by such law.

LEGAL MATTERS

Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., Boston, Massachusetts, will pass upon the validity of the issuance of the securities offered by this prospectus.

EXPERTS

The consolidated financial statements of ImmunoGen, Inc. appearing in ImmunoGen, Inc.'s Annual Report (Form 10-K) for the year ended June 30, 2010, (including the schedule appearing therein) and the effectiveness of ImmunoGen, Inc.'s internal control over financial reporting as of June 30, 2010 have been audited by Ernst & Young LLP, independent registered public accounting firm, as set forth in their reports thereon, included therein, and incorporated herein by reference. Such consolidated financial statements and schedule are incorporated herein by reference in reliance upon such reports given on the authority of such firm as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

We are subject to the reporting requirements of the Securities Exchange Act of 1934, as amended, and file annual, quarterly and current reports, proxy statements and other information with the SEC. You may read and copy these reports, proxy statements and other information at the SEC's public reference facilities at 100 F Street, N.E., Room 1580, Washington, D.C. 20549. You can request copies of these documents by writing to the SEC and paying a fee for the copying cost. Please call the SEC at 1-800-SEC-0330 for more information about the operation of the public reference facilities. SEC filings are also available at the SEC's web site at http://www.sec.gov. Our common stock is listed on The NASDAQ Global Select Market, and you can read and inspect our filings at the offices of the Financial Industry Regulatory Authority at 1735 K Street, Washington, D.C. 20006.

This prospectus is only part of a registration statement on Form S-3 that we have filed with the SEC under the Securities Act of 1933, as amended, and therefore omits certain information contained in the registration statement. We have also filed exhibits and schedules with the registration statement that are excluded from this prospectus, and you should refer to the applicable exhibit or schedule for a complete description of any statement referring to any contract or other document. You may inspect a copy of the registration statement, including the exhibits and schedules, without charge, at the public reference room or obtain a copy from the SEC upon payment of the fees prescribed by the SEC.

We also maintain a web site at www.immunogen.com, through which you can access our SEC filings. The information set forth on our web site is not part of this prospectus.

Table of Contents

INCORPORATION OF DOCUMENTS BY REFERENCE

The SEC allows us to "incorporate by reference" information that we file with them. Incorporation by reference allows us to disclose important information to you by referring you to those other documents. The information incorporated by reference is an important part of this prospectus, and information that we file later with the SEC will automatically update and supersede this information. Statements in this prospectus regarding the provisions of certain documents filed with, or incorporated by reference in, the registration statement are not necessarily complete and each statement is qualified in all respects by that reference. Copies of all or any part of the registration statement, including the documents incorporated by reference or the exhibits, may be obtained upon payment of the prescribed rates at the offices of the SEC listed above in "Where You Can Find More Information." The documents we are incorporating by reference are:

- our annual report on Form 10-K for the fiscal year ended June 30, 2010 filed on August 27, 2010;
- our quarterly report on Form 10-Q for the fiscal quarter ended September 30, 2010 filed on October 29, 2010;
- our quarterly report on Form 10-Q for the fiscal quarter ended December 31, 2010 filed on February 8, 2011;
- our quarterly report on Form 10-Q for the fiscal quarter ended March 31, 2011 filed on May 5, 2011;
- our current report on Form 8-K filed on July 7, 2010;
- our current report on Form 8-K filed on September 24, 2010;
- our current report on Form 8-K filed on November 18, 2010;
- our current report on Form 8-K filed on December 3, 2010;
- our current report on Form 8-K filed on December 23, 2010;
- the portions of our definitive proxy statement on Schedule 14A filed on October 4, 2010 that are deemed "filed" with the SEC under the Securities Exchange Act of 1934, as amended; and
- the description of our capital stock contained in our registration statement on Form 8-A filed on September 25, 1989, as amended by Amendment No. 1 thereto, filed on November 15, 1989, under the Securities Exchange Act of 1934, as amended, including amendment or reports filed for the purpose of updating such description.

The SEC file number for each of the documents listed above is 001-17999.

In addition, all documents subsequently filed by us pursuant to Section 13(a), 13(c), 14 or 15(d) of the Securities Exchange Act of 1934, as amended, before the date any offering under this prospectus is terminated or completed are deemed to be incorporated by reference into, and to be a part of, this prospectus (except for information contained in any such filing where we indicate that such information is being furnished and/or is not considered "filed" under the Securities Exchange Act of 1934, as amended).

Any statement contained in this prospectus or in a document incorporated or deemed to be incorporated by reference into this prospectus will be deemed to be modified or superseded for purposes of this prospectus to the extent that a statement contained in this prospectus or any other subsequently filed document that is deemed to be incorporated by reference into this prospectus modifies or supersedes the statement. Any statement so modified or superseded will not be deemed, except as so modified or superseded, to constitute a part of this prospectus.

17

Table of Contents

We will provide without charge to each person, including any beneficial owner, to whom a copy of this prospectus is delivered, upon the request of any such person, a copy of any or all of the information incorporated herein by reference (exclusive of exhibits to such documents unless such exhibits are specifically incorporated by reference herein). Requests, whether written or oral, for such copies should be directed to ImmunoGen, Inc., Attention: Investor Relations, 830 Winter Street, Waltham, MA 02451, 781-895-0600.

You should rely only on information contained in, or incorporated by reference into, this prospectus and any prospectus supplement. We have not authorized anyone to provide you with information different from that contained in this prospectus or incorporated by reference in this prospectus. We are not making offers to sell the securities in any jurisdiction in which such an offer or solicitation is not authorized or in which the person making such offer or solicitation is not qualified to do so or to anyone to whom it is unlawful to make such offer or solicitation.

Shares

Common Stock

PROSPECTUS SUPPLEMENT

Joint Book-Running Managers

Morgan Stanley **Jefferies**

July , 2012