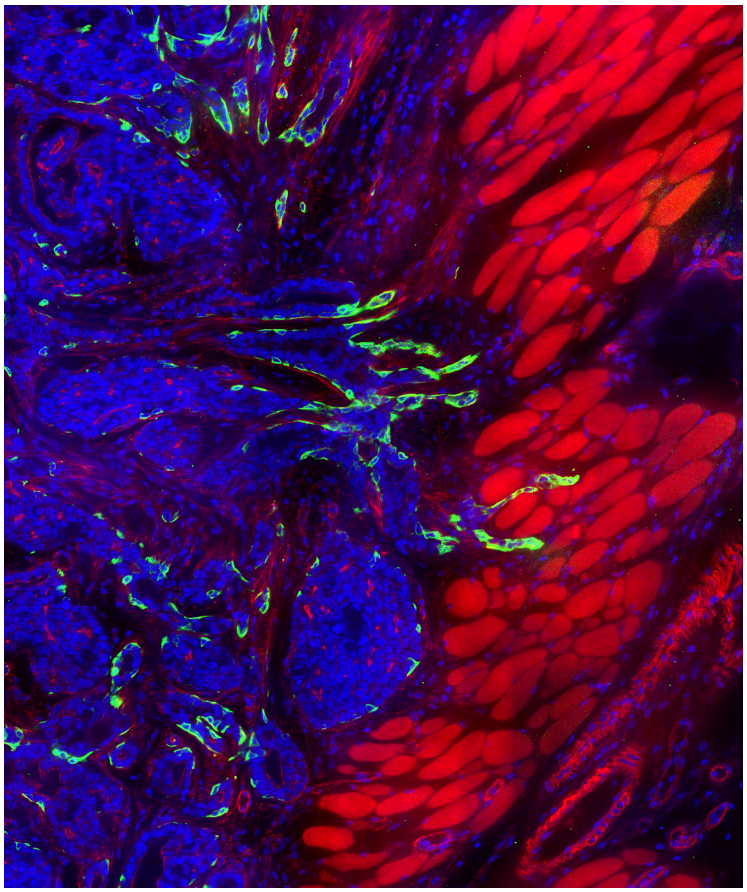
Assessment of Grantee Impacts from The Mary Kay Foundation's Cancer Research Program



THE MARY KAY FOUNDATION℠

COVER IMAGE:
Basal breast cancer cells (green) leading collective invasion strands into the surrounding muscle (red). Cell nuclei are labeled in blue.
Credit: Dr. Kevin Cheung of the Ewald Laboratory.

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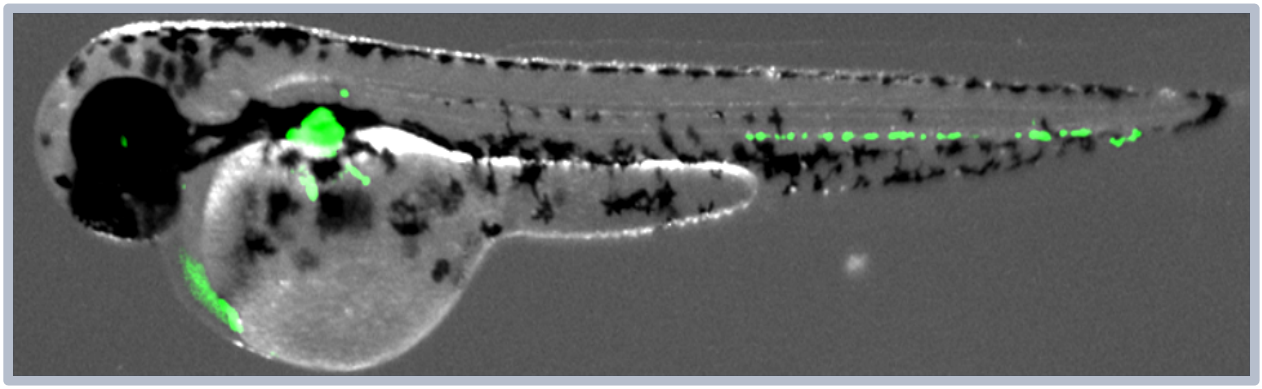
DEDICATION

This report is dedicated to the fearless warriors who have bravely fought women's cancers; the tireless heroes who continue to seek cures; and to Mary Kay Ash whose legacy and vision to enrich the lives of women lives on through The Mary Kay Foundation.



Green fluorescent protein-labeled human breast cancer cells (green) injected into a 2-day old zebrafish embryos. After 2-3 days, the breast cancer cells can be seen spreading to other parts of the fish's body, such as the tail and eyes.

Image credit: Dr. Sovannarith Korm of the Feng laboratory.

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EXECUTIVE SUMMARY

In September 2020, the American Institute of Biological Sciences (AIBS) conducted a survey of grantees who had received funding from The Mary Kay Foundation's™ (TMKF's) Cancer Research Program between 1997-2018. The survey was designed to assess the impact of the foundation's funding on its grantees in terms of advancement of lines of research and scientific breakthroughs, productivity, and career trajectory. The survey was disseminated to a total of 207 grantees, and an impressive **30% responded.** Of the 61 respondees**, 70% were male** and **30% were female**, which aligns well with the foundation's rate of 1 in 3 grants being awarded to female applicants.

The responses painted the picture of a highly motivated and productive group of researchers dedicated to finding a cure for women's cancers. In terms of research productivity, **54 (89%)** of the respondents indicated that the findings of their TMKF funded projects had resulted in **scientific publications** (defined as peer-reviewed and non-peer-reviewed scientific articles, white papers, and closed access publications), with the numbers of publications ranging from 1 to 20 and the **majority (67%)** occurring in the **1-5 range**. Further, most **(72%)** respondents indicated that the findings of their TMKF funded research projects led to **follow-on research awards**, with the **majority (85%)** occurring in the **1-3 range**, and **82% r**eporting that their TMKF supported projects led to **new research collaborations**. The findings of the TMKF's funded projects were also reported to have a significant impact on the field of women's cancer research in terms of **shifting/challenging paradigms (80%** of respondents**), developing new approaches/techniques/technologies (72%** of respondents**)**, **shaping the course of research in the field (71%** of respondents**),** and findings being **translated directly or indirectly into the clinic (71%** of respondents**)**.

As a group of academics, The Mary Kay Foundation grantees represent hard-working and successful researchers who have experienced steep advancing career trajectories, with **76%** of respondents having been **promoted** since receiving their TMKF awards, and the majority (**80%)** of those promotions being given to **Assistant Professors.** Past the 11 year mark of award receipt, **100% of eligible Assistant and Associate Professors** had been **promoted.** Further, **most** respondents reported that the foundation's funding was not only critical to their **career progression** (**91.8%)** but also **shaped the course of their subsequent research programs (95.1%).**

A group of grantees was selected in consultation with TMKF for case study analysis based on productivity, impact on the field of women's cancers, career progression, and compelling personal and human impact stories. While many of the accomplishments and stories provided by the 61 respondents were inspirational and significant, **10 extraordinary grantees stood out. The group consisted of 5 men and 5 women** at different stages in their careers. While some had established research programs and careers that had been propelled by the foundation's funding, others were earlier in their careers and still in the award cycle and process of uncovering exciting new findings. A consistent message across the board was how funding from

the foundation came at a critical time in each of the awardee's careers, often times when all other funding sources had been exhausted leaving the research programs in precarious situations. Moreover, a number **(40%)** of the case study grantees had been **personally affected by a women's cancer diagnosis in a relative or close friend,** which served as a catalyst for their research in the field. Irrespective of a personal connection to women's cancers, the group showed an unwavering determination to discover a cure or treatment, often thinking outside the box and employing an unorthodox and/or multidisciplinary approaches to tackle the problem. Their remarkable findings and accomplishments are a testimony to how, when a promising concept or innovation is believed in and backed by a supportive funding organization, such as TMKF, there is no limit to the discoveries and advances that can be made.

INTRODUCTION

The Mary Kay Foundation™ (TMKF) is a nonprofit, philanthropic organization that receives donations from members of the general public, the Mary Kay independent sales force, and the Mary Kay employees to fund research that impacts women's health. Part of the research that the foundation funds is focused on finding a cure for cancers that affect women. In 1997, the first grants were awarded to fund 6 innovative research programs that targeted breast and ovarian cancers. Since then, grants have been awarded each year to researchers investigating women's cancers at accredited medical schools recommended by TMKF Research Review Committee, a group of prominent experts who volunteer their time to help the foundation select the best recipients across the United States. After reviewing the recommendations of the committee, the foundation's Board of Directors selects the grant recipients. Approximately 10-15 research projects are funded each year.

On September 14, 2020, the American Institute of Biological Sciences (AIBS) Scientific Peer Advisory and Review Services (SPARS) Division was contracted by ~~the~~ TMKF to provide an assessment of the overall impact of its funding on grantees who received funding through the foundation's Cancer Research Program between 1997-2018 in terms of the advancement of lines of research and scientific breakthroughs, productivity (publications, follow-on funding success, and collaborations), and career trajectory. The assessment is designed to supplement the previously commissioned Unger Report—which analyzed the scientific impact of the foundation's Cancer Research Program in terms of publication output, citations, and impact factors—by soliciting feedback from the grantees to highlight compelling research and personal achievements over the 25-year history of the program.

MATERIALS AND METHODS

SURVEY CONSTRUCTION AND TESTING

The American Institute of Biological Sciences developed a comprehensive survey soliciting quantitative and qualitative feedback based on the following areas of interest delineated in the terms of reference document— ***advancement of lines of research, follow-on funding success, publications, collaborations, and career trajectory***. The types of questions used in the survey included dichotomous, multiple choice, and open-ended questions. Not all questions were required, thereby allowing respondents who answered no to a particular question to skip the follow-on open-ended question.

The survey was reviewed by the foundation and updated based on the feedback received. The final version of the survey consisted of four~~s~~ section—***About You (Demographics), Research Productivity, Research Impact, and Career Path***—with the number of questions in each section ranging from 3-7. The survey was imported into Wufoo, a commercial online form builder

software with a secure cloud storage database, for dissemination, where it was first test run by a group of AIBS staff members and verified to be working correctly. A copy of the survey is appended.

SURVEY DISSEMINATION AND FOLLOW-UP

On September 29, 2020, a link to the survey was disseminated via email to a total of 207 Cancer Research Program grantees who had received funding from TMKF between 1997-2018. The email addresses of the grantees had been verified by the foundation. The letter accompanying the email instructed the grantees to prepare two documents for upload prior to completing the survey: 1) an NIH style CV with an asterisk denoting any research publication that was supported by TMKF funding; and 2) a single document containing any stories, letters, acknowledgements, anecdotes, etc., that illustrate the positive impact that TMKF funding has had on human lives.

Following dissemination of the survey, three sets of email reminders were sent to non-respondents over a 4-week period. The first was sent on October 13, 2020, the second on October 21, 2020, and the third on October 27, 2020. The first and third reminders were sent by AIBS and the second by ~~the~~ TMKF. In addition, on October 19, 2020, a personalized email reminder was disseminated to the group of 15 grantees who had been identified as exceptional researchers by the Unger analysis based on their impressive publication metrics. The survey was inactivated on November 2, 2020.

RESULTS

SURVEY RESPONSE RATE

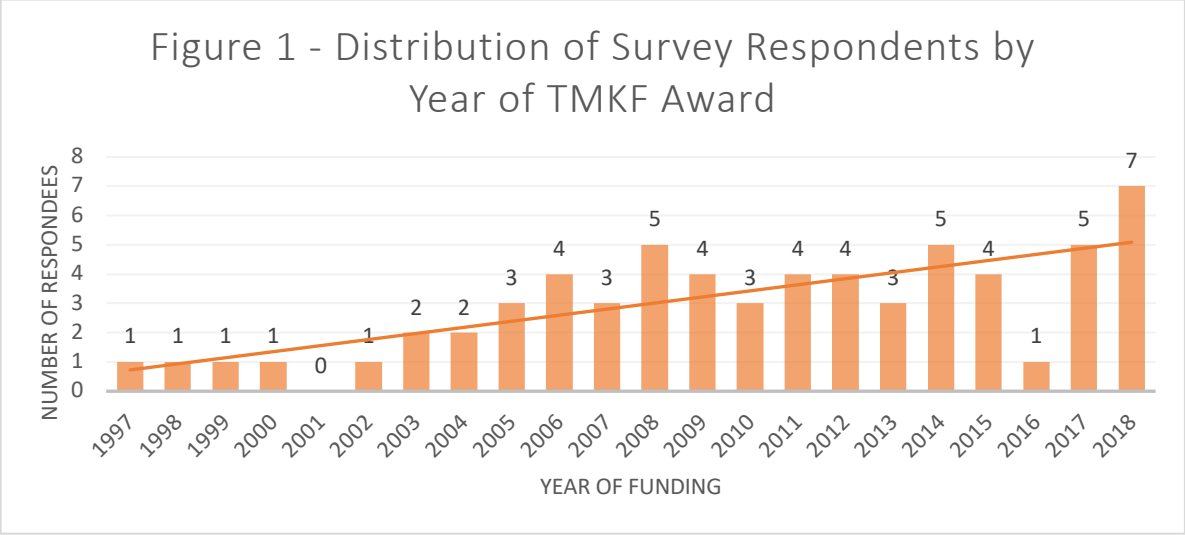
Of the 207 email invitations sent to the Cancer Research Program grantees who had received funding from TMKF between 1997-2018, only 2 bounced back. New email addresses were located for those two grantees and their invitations were resent. Upon inactivation of the survey on November 2, 2020, a total of 61 grantees (30%) had completed the survey. In terms of the non-respondents, 4 of the 146 (3%) indicated via email their intent not to participate in the survey, and an additional grantee (1%), stated that they had filled out the survey, but did not complete it.

SURVEY RESPONSE ANALYSIS

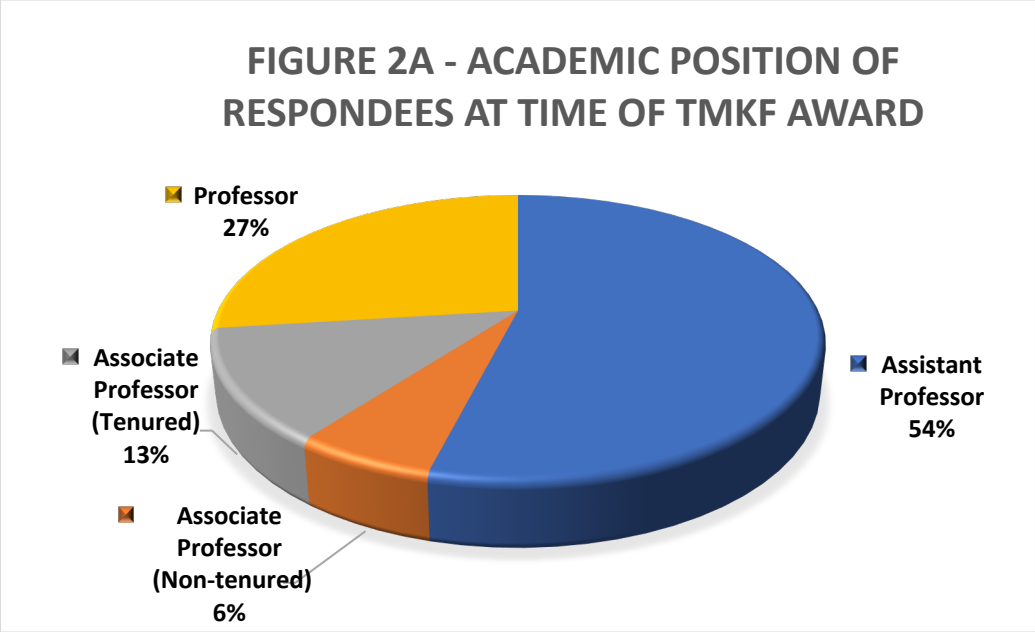
Survey responses that yielded dichotomous, categorical, or numeric answers were analyzed using descriptive statistics. Three responses in the third category necessitated follow-up via email and were updated based on the clarifications provided by the authors.

RESPONDENT DEMOGRAPHICS

A little more than two thirds (43; 70%) of the survey respondents were male and 18 (30%) were female. All of the respondents reported their current place of work as being an academic institution. When analyzed by year of award, the number of respondents ranged from 0 to 7 and showed a progressive increase in numbers the more recent the year of award, the exception being 2016 (see Figure 1).



There was a notable shift in academic positions over time, with the majority of respondents (54%) being an Assistant Professor at the time of receiving their award (Figure 2A) versus the majority (61%) of respondents being full Professors at the time of completing the survey (Figure 2B). The percentages of Associate Professors (tenured and non-tenured) remained fairly stable.



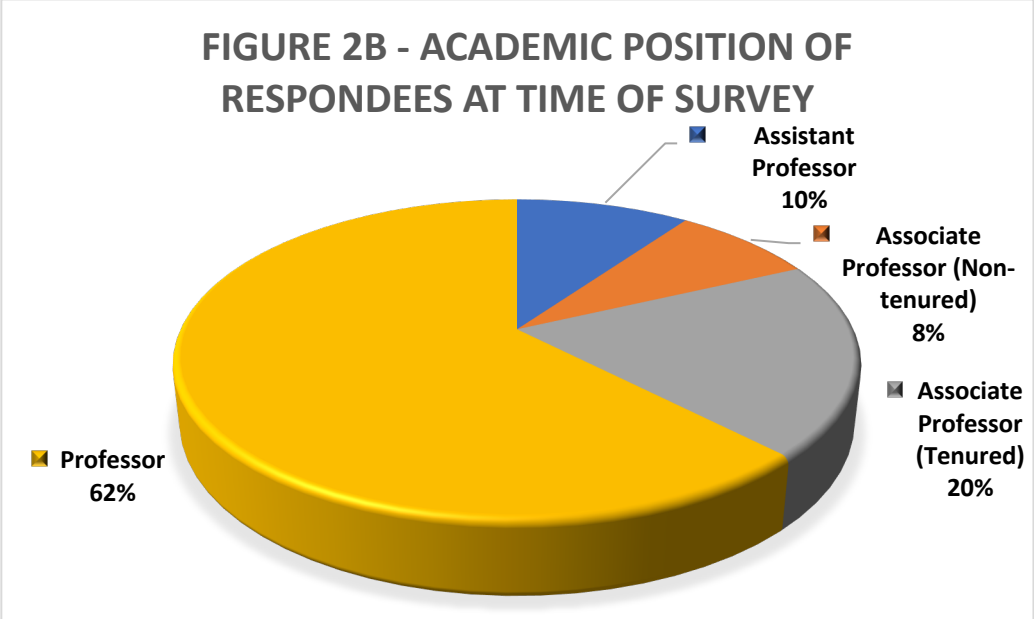


Table 1 illustrates the number of awardees who were promoted over time. Fifteen of the respondents had reached the maximum academic rank of full Professor at the time of their award. Of the remaining 46, 35 (76%) reported having been promoted since receiving their TMKF awards, with the majority (80%) of promotions being given to Assistant Professors. Of the Assistant Professor who had received an award within the past 2-5 years, 50% had been promoted to Associate or full Professors, and of those who had received an award within the

past 6-10 years, 78% had been promoted to Associate or full Professors. Past the 11 year mark of award receipt, 100% of eligible Assistant and Associate Professors had received a promotion.

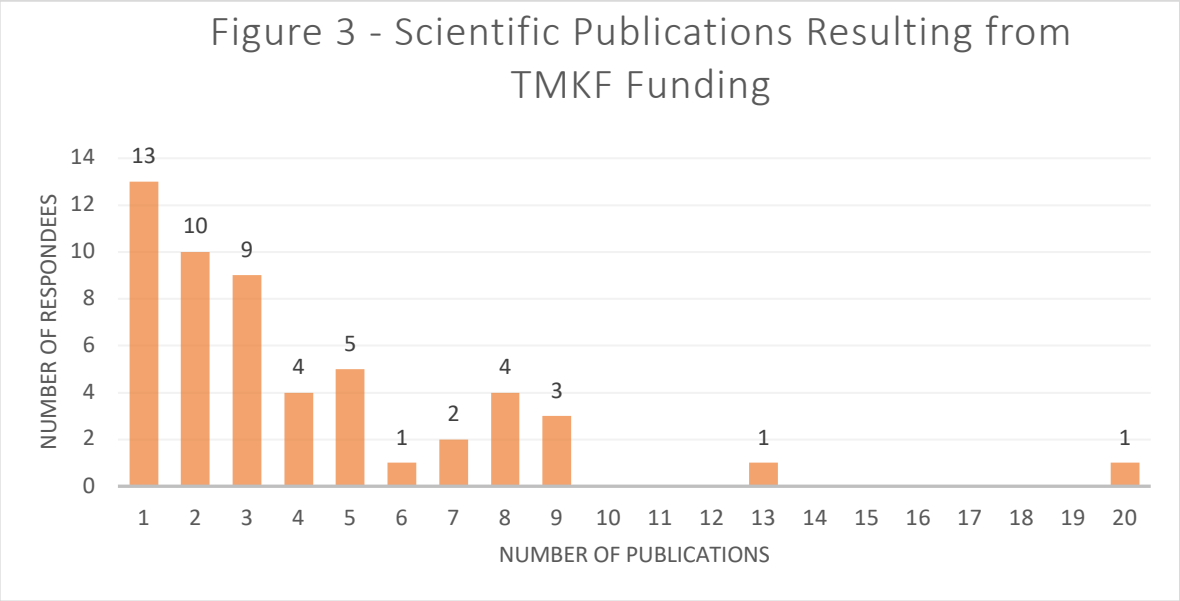
The majority (82%) of respondents who reported remaining at the same academic rank were early on in the funding cycle, having received their awards within the past 2-5 years. The remaining 18% were within 6-10 years of award receipt.

Table 1 – Number of Awardee Promotions Over Time

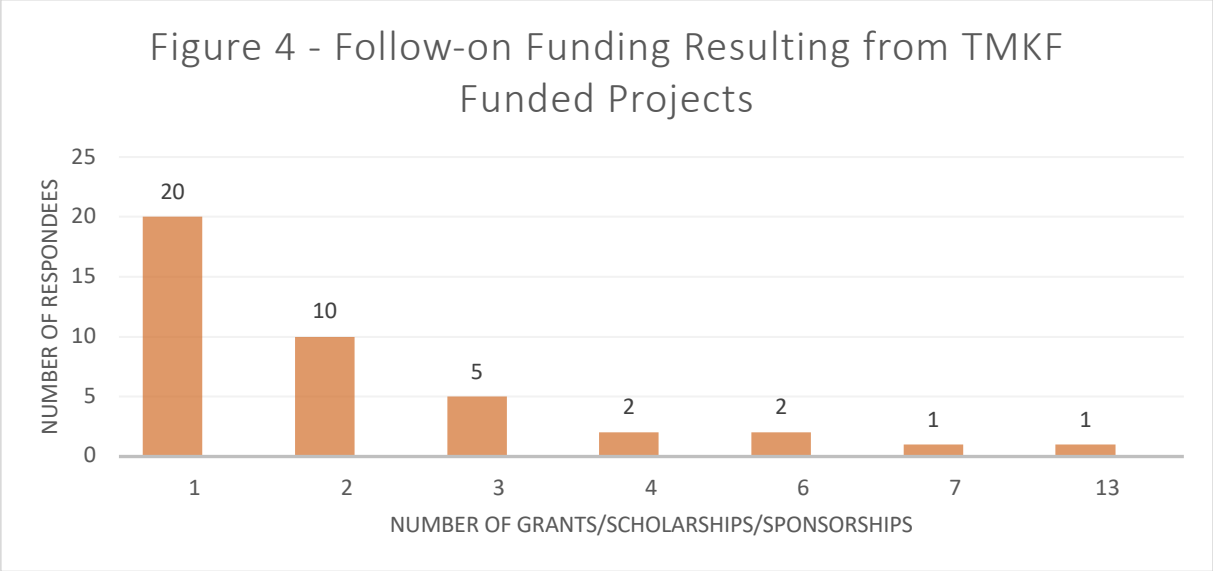
Promotion	2 -5 Years Since Award	6-10 Years Since Award	11-15 Years Since Award	16-20 Years Since Award	20+ Years Since Award	Total
Assistant Professor to Associate Professor (NT)	1	0	0	1	1	3
Assistant Professor to Associate Professor (T)	3	4	2	0	0	9
Assistant Professor to Professor	1	3	10	1	1	16
Associate Professor (NT) to Associate Professor (T)	0	0	0	0	0	0
Associate Professor (NT) to Professor	0	0	2	0	0	2
Associate Professor (T) to Professor	0	2	2	0	1	5
					Total Promotions	**35**
Non-Promotions						
Remained at Assistant Professor	5	1	0	0	0	6
Remained at Associate Professor (NT)	2	0	0	0	0	2
Remained at Associate Professor (T)	2	1	0	0	0	3
					Total Non-Promotions	**11**
Full Professor at Award	3	5	4	3	0	15
					Total Full Professors at Award	**15**

RESEARCH PRODUCTIVITY

When asked whether the research project(s) funded by TMKF led to any scientific publications, white papers, closed access publications or non-peer reviewed research articles, 54 (89%) of the 61 respondents indicated that they had. One of the respondents who stated yes, however, noted that the publications were indirect and did not provide a number. The number of scientific publications ranged from 1 to 20, with 1 being the most commonly reported number (25%), as illustrated in Figure 3. Further, the majority (67%) of publications reported were in the 1-5 range.



In terms of whether the findings of their TMKF funded research project(s) led to further research funding, 44 (72%) of the respondents indicated that they did. Of the 44 respondents who answered affirmatively, 3 (7%) did not provide any additional information. Figure 4 shows the range of follow-on research awards secured by respondents, with 1 being the most commonly reported number (49%) and 1-3 representing the majority (85%) of follow-on awards secured with the research findings. In addition, 50 (82%) of the respondents indicated that the findings of their research projects led to new research collaborations.



RESEARCH IMPACT

Grantees were asked a series of four questions about the impact of their research findings on the field, and the majority of respondents indicated a positive impact in all four areas. Of the respondents, 49 (80%) reported that their research challenged an existing paradigm or led to the development of a new paradigm, 44 (72%) reported that their research resulted in the development of a new approach/technique/technology, 43 (71%) reported that it led to a seminal finding that shaped the subsequent course of research in the field, and 40 (66%) reported that their findings were translated directly or indirectly into the clinic.

CAREER PATH

Grantees were asked a series of three questions about the impact of TMKF funding on their career trajectory, with the majority reporting a positive impact in the first two areas. In terms of whether the funding was critical to their career progression, 56 (92%) of the respondents reported that it was, and whether the findings of their TMKF funded project(s) shaped the subsequent course of their research program, 58 (95%) of respondents reported that it did. When asked whether the funding led to a prestigious accolade, national or international board affiliation, or scientific service, 22 (36%) of the respondents reported that it had.

CASE STUDIES SELECTION

Based on the survey responses provided, and in conjunction with the Unger Report finding of a group of 15 exceptional researchers, a group of 10 noteworthy grantees was selected in consultation with TMKF for case study analysis. The purpose of the case studies is to highlight compelling personal impact stories, interesting facts/quotes, etc. for use in the foundation's annual reports, press releases, and as examples of TMKF's cancer research contributions. Unlike the Unger analysis, publication metrics were not the only factors used to select the grantees. Selection factors included: 1) productivity based on publications, additional research funding, and collaborations secured as a result of TMKF funding; 2) a significant impact on the field based on paradigm shifting research findings, development of an innovative approach/technique /technology, seminal findings that changed the course of research in the field, or translation of the research findings to the clinic; 3) career progression; and 4) compelling personal and human impact stories. The 10 awardees, listed below in Table 2, were selected for case study analysis based on their compelling responses in the above categories while also balancing the need to represent awardees across all stages of academic rank. One of the awardees selected, Kambiz Dowlatshahi, had retired from the field and did not fill out the survey. However, the Vice President of the company that Dr. Dowlatshahi founded provided some compelling information via email, which secured Dr. Dowlatshahi's selection.

Table 2 – TMKF Awardee Case Studies

Awardee Name	Gender	Place of Work	Current Position	Year of Award
Judith Agudo	Female	Dana-Farber Cancer Institute	Assistant Professor	2018
Doris Benbrook	Female	Stephenson Cancer Center, University of Oklahoma Health Sciences Center	Associate Professor (Non-tenured)	1998
Kambiz Dowlatshahi	Male	Novian Health	Founder & Director (Retired)	1997
Ronny Drapkin	Male	University of Pennsylvania	Associate Professor (Tenured)	2010
Andrew Ewald	Male	Johns Hopkins University, School of Medicine	Professor	2013
Hui Feng	Female	Boston University	Associate Professor (Non-tenured)	2016
Melissa Herbst-Kralovetz	Female	University of Arizona	Associate Professor (Tenured)	2017
Leaf Huang	Male	University of North Carolina at Chapel Hill	Professor	2005
Laurie Littlepage	Female	University of Notre Dame	Associate Professor (Tenured)	2015
Binhua Zhou	Male	University of Kentucky College of Medicine	Professor	2009; 2014

DISCUSSION

SURVEY RESPONSE RATE AND RESPONDENTS

The Mary Kay Foundation Grantee Survey yielded a very respectable response rate of 30%, which is considerably higher than the 10-15% response rate reported for external surveys by the online survey company PeoplePulse and the 9% response rate reported by AIBS in its comprehensive peer review survey of scientists (Gallo et al., 2019). It is more in line with the average online survey response benchmark of 33% reported by Linderman (2019). Further, the breakout of respondents by gender (70% male and 30% female) corresponds well with the 1 in 3 grants awarded to female applicants by the foundation, as noted in the Unger Report, and thus is representative of the awardee pool. All respondents reported their current place of work as an academic institute, which is not particularly surprising given the research focus of this group of scientists.

The increase seen in the numbers of respondents from the more recent years of award can, in part, be explained by the fact that the number of awardees has increased over the years, as noted in the Unger Report, which reported that the number of awardees increased from 5 per year during the earliest 5-year funding period (1997-2001) to 12 per year during the most recent 5-year period (2014-2018). Another factor that could explain this increase in responses is that newer awardees are more likely to remember the funding award in detail, which may have served as greater motivation to complete the survey. This is supported by the email response of one awardee, who gave “My grant was ages ago,” as the reason for not participating in the survey.

AWARDEE RESEARCH PRODUCTIVITY

The Mary Kay Foundation grantees represent a highly productive group of researchers. A high percentage (89%) reported publishing the findings of their TMKF funded research projects in scientific publications, white papers, closed access publications, or non-peer reviewed research articles, with the majority (67%) publishing between 1-5 articles. These numbers are supported by the Unger analysis, which found the average number of publications per grant award to be 2.5. Moreover, the majority (72%) of respondents indicated that the findings of their TMKF funded research projects led to further research funding, which included awards from national, regional, and private funding bodies, scholarships, and pharmaceutical/biotechnology company sponsorship. The most commonly (49%) reported number of follow-on awards was 1, with the majority (85%) of follow-on awards occurring in the 1-3 range. In addition, most (82%) TMKF supported projects led to new research collaborations, with collaborations reported internationally, within and across academic departments and institutes, as well as with pharmaceutical/biotechnology companies.

RESEARCH IMPACT

The findings of the TMKF's funded projects have had a positive impact on the field of women's cancer research in a number of significant ways. Most respondents indicated that their research findings challenged an existing paradigm or led to the development of a new paradigm (80%), resulted in the development of a new approach/technique/technology (72%), led to a seminal finding that shaped the subsequent course of research in the field (71%), and/or were translated directly or indirectly into the clinic (71%). This suggests that the TMKF funding is having a real world effect that shapes the foundation of the research in the field by directing its progression; improving the methods and tools to research, detect, and diagnose female cancers; and having a meaningful impact on treatment of cancer patients in the clinic. For example, the origin of ovarian cancer was historically thought to be cells on the surface of the ovary. The research of one of the case study awardees, Dr. Ronny Drapkin, challenged this paradigm by showing that the majority of ovarian cancers actually emerge from the fallopian tube, not the ovary, thereby shifting the subsequent course of research in the field. The funding received by another case study awardee, Dr. Kambiz Dowlatshahi, enabled him to conduct the research that established the basis for Novilase, a minimally invasive alternative to breast lumpectomy, that has recently been granted European approval and has led to an Investigational Device Exemption (IDE) from the FDA for a pivotal trial that should lead to US approval within 2 years. A third case study awardee, Dr. Doris Benbrook, is currently testing the ability of a heteroarotinoid drug, discovered through her TMKF funding, to inhibit ovarian cancer in a first-in-human clinical trial.

CAREER PATH

The Mary Kay Foundation grantees are a group of hard-working and successful researchers whose work has led to an impressive career trajectory. The majority of respondents reported that the foundation's funding was not only critical to their career progression (92%) but also in shaping the course of their subsequent research programs (95%). In terms of promotions, the grantee pool experienced a notable rise in academic rank over the years, with the biggest shift in position seen from Assistant Professor at the time of award (54%) to full Professor at the time of completing the survey (61%). In terms of awardees who were eligible for promotion (some awardees were already full Professors at the time of their awards), most (76%) reported being promoted since receiving their awards, with 80% of those promotions being given to Assistant Professors. The Assistant Professors saw a significant trend in promotions over time, with 50% being promoted to Associate or full Professor within 2-5 years of award receipt and 78% being promoted to Associate or full Professor within 6-10 years of award receipt. Most impressively, by 11+ years of award receipt, all eligible Assistant and Associate Professors had received a promotion. These findings show that, as a group, TMKF awardees experienced promotions at a faster rate than the median 6-year promotion time from Assistant to Associate Professor for clinician scientists reported by Beasley et al. (2005) and the average 7-year-in-rank

from Associate to full Professor reported by Penn State in 2007, which puts them on a steeper career trajectory than average.

AWARDEE CASE STUDIES

The grantees selected in consultation with TMKF for case study analysis represent an extraordinary group of 5 men and 5 women who stand out in terms of their productivity, impact on the field of women's cancers, career progression, and compelling personal and human impact stories. While at different stages of their careers—some have established research programs and careers, others are earlier in their careers and still in the award cycle and process of uncovering exciting new findings—a consistent message across the board is how critical the foundation's funding was to each of their careers, often coming at a time when research programs were on dangerous ice. Further, a number (40%) of the case study grantees had been personally affected by a women's cancer diagnosis in a relative or close friend, which often changed the course of their research into the field of women's cancer. As a group, the grantees are unwavering in their determination to discover a cure or treatment, often thinking outside the box and employing unorthodox and/or multidisciplinary approaches to tackle the problem. They truly are inspirational.

One interesting finding, as it relates to women's careers in scientific research, is that all five of the female case study awardees reported having active mentoring roles, whereas none of the men did. In spite of the impressive increase of women in the STEM fields since the 1970s (Ceci and Williams, 2010), there continues to be a disproportionate number of men in higher academic ranks than women, with the number of men at Associate-full Professor ranks far outnumbering the number of women (Duch et al., 2012). Many factors have been attributed to the slower progression of women along the STEM academic career path, such as greater teaching responsibilities and less protected research time (Viglione, 2020; Isselbacher, 2020). It is possible mentorship roles also chip away at the time female scientists can devote to their own research programs, thereby having a cumulative impact on their overall productivity.

JUDITH AGUDO, PHD (YEAR OF AWARD: 2018)

Dr. Judith Agudo is an Assistant Professor of Immunology at Dana-Farber Cancer Institute and Harvard Medical School in Massachusetts. She received her PhD in regenerative medicine in 2009 from the University Autonomous Barcelona in Spain. She completed her post-doctoral training in the US, where she gained experience in dendritic cell and T cell immunology. When Dr. Agudo established her own laboratory in 2017, she was determined to devote part of her research program to breast cancer immunology after being profoundly impacted by the disease when it struck two close women in her life. As an early career scientist with very little experience in breast cancer, she was able to capitalize on the seed-type funding offered by the TMKF Cancer Research Program by securing an award in 2018 to use a novel approach to study

immune evasion of dormant disseminated breast cancer cells in the bone marrow. Although still early in the award cycle and not yet published, her research has already found that while most breast cancer cells that leave the primary tumor in the breast are targeted and eliminated by the immune system, a fraction can evolve to escape. Utilizing novel murine models and tools developed in her laboratory, she has identified pathways involved in DNA damage repair and the recruitment of specialized myeloid cells as the major mechanisms of protecting surviving disseminated breast cancer cells.

> *"The Mary Kay Foundation believed in my bold ideas, and the initial funding gave me the tools and resources to start a breast cancer program."*

Funding from TMKF not only shaped the line of research in Dr. Agudo's laboratory at a critical juncture in her career and helped secure additional funding, but also provided her with recognition at the Dana-Farber Cancer Institute, which has led to connections and collaborations with leading breast cancer researchers and oncologists at the institute. Through these collaborations, the team is able to push their collective research in breast cancer immunology much further than any of the members could do separately.

> *"We are really committed to using the immune system to prevent metastasis, which is what kills most breast cancer patients."*

Based on the promising results that are emerging in the field of cancer immunotherapy and the prospect of exploiting the immune system for the treatment of breast cancer, Dr. Agudo has become a key immunology advisor to the breast cancer group at her institute. Importantly, this position has provided her with the opportunity to interact with patient advocates, which has become one of the most rewarding experiences of her career. Not only has she met with advocates on multiple occasions to discuss and receive feedback on her research from a patient perspective, but she has also taught the advocates some basic cancer immunology classes. Interacting with the advocates has continued to put a face to breast cancer, and Dr. Agudo has been surprised by how insightful and intelligent this group of women are and how eager they are to learn about the immune system and how immunotherapy works. Likewise, the patient advocates have been very excited and appreciative of having such intricate science communicated to them.

> *"My work with the Dana-Farber Cancer Institute Breast Cancer group has put me in contact with patient advocates who have been amazing and have taught me so much about the disease and have helped my research a lot by always keeping [the patient] in mind."*

DORIS BENBROOK, PHD (YEAR OF AWARD: 1998)

Dr. Doris Benbrook is a Presbyterian Health Foundation Presidential Professor in Obstetrics & Gynecology at the Stephenson Cancer Center, University of Oklahoma Health Sciences Center. She received her PhD in biochemistry in 1985 from Loyola University Medical Center in Maywood, IL. Her postdoctoral training in nuclear receptors and transcription factors was conducted at the Burnham Institute in California and the Cancer Research Center in London, UK. Since establishing her own laboratory, her research has focused on the development of drugs for the prevention and treatment of gynecologic cancers as well as other cancers and diseases. As an Assistant Professor, Dr. Benbrook received much needed funding from TMKF in 1998 for a project on the development of retinoids and response biomarkers for ovarian cancer, which was a critical stepping stone needed to bring her burgeoning research program to the national level.

> *"As I started my independent research career, my goal was to gain knowledge of how cancer develops and how it can be treated without toxicity."*

In collaboration with a chemist, Dr. Benbrook developed synthetic versions of retinoids that were more effective and less toxic than natural retinoids. The TMKF funding provided her with the equipment and resources needed to test the lead synthetic retinoids, heteroarotinoids (Hets), in 3D organotypic cultures of ovarian cancer, established in her laboratory, which led to the discovery that Hets were not retinoids but instead worked independently of retinoid receptors. She and her team also discovered that Hets could inhibit ovarian cancer independently of retinoid receptors and retinoid side effects. Using the data generated from the TMKF grant, she was able to obtain her first R01 grant to study how the lead Het, SHetA2, works to inhibit ovarian cancer without causing toxicity. The findings were published in the prestigious *Journal of the National Cancer Institute*.

> *"This process from bench-to-beside took many years and is a rare occurrence in an academic setting without the investment of a pharmaceutical company."*

As a result of the dogged determination and incredible progress that she and her team have made over the years on their lead candidate, Dr. Benbrook is initiating a National Cancer Institute (NCI)-supported first-in-human clinical trial of SHetA2. In the process of bringing a drug from concept through clinical trials, she has gained invaluable experience in recruiting and leading multi-disciplinary teams with the expertise needed to take the research from its current stage in the translational research pipeline to the next level as well as securing funding to support her work. She enjoys sharing the knowledge gained throughout this process by teaching and mentoring the next generation of scientists. Her mentoring success has been recognized by the Oklahoma Shared Clinical and Translational Resources, who named her a Master Mentor. In addition, her expertise and accomplishments are recognized at national and international levels through her service as chair and member of multiple national scientific review committees and Editor-in-Chief of the journal *Biologics: Targets & Therapy*, permanent

member of the NCI Subcommittee A: Cancer Centers, and co-Leader of the GYN Target Group of the NCI PREVENT MW Clinical Prevention Trials Network.

> *"In the grand scheme of things, The Mary Kay Foundation award provided me with the capability to complete a critical step needed to bring a drug from concept through clinical trial."*

KAMBIZ DOWLATSHAHI, MD, FACS (YEAR OF AWARD: 1997)

Dr. Kambiz Dowlatshahi is a former Professor of Surgery at Rush University Medical Center in Chicago and the founder and former Director of Novian Health. He received his MD from the University of London and spent more than 25 years in the field of breast cancer treatment. He is a pioneer of micro-invasive breast cancer procedures and, in 1985, helped introduce stereotactic needle breast biopsy to the US for the diagnosis of breast lesions (now in use in over 2,000 breast centers in the US). Dr. Dowlatshahi saw the possibility for a therapeutic outgrowth of the diagnostic procedure—a percutaneous laser ablation of the breast—and was among the first wave of grantees to receive an award through TMKF's Cancer Research Program in 1997 to explore this innovative concept. Funding from the foundation, as well as other sources, enabled him to conduct necessary early research on the use of interstitial laser therapy for the treatment of small, non-palpable breast cancers, which established the basis for Novilase, a percutaneous, ultrasound-guided laser therapy to replace surgery.

> *"Laser is the destruction of cancer with heat. The end result is the destruction of malignant or cancer cells."*

Today, after multiple clinical trials in the US, UK ,and France, Novilase is being used as a minimally invasive alternative to lumpectomy for early stage breast cancer. The procedure is performed on an outpatient basis with local anesthesia and can be completed in around 15 minutes, offering potentially significant advantages over surgery, including minimal scarring, quicker recovery, and less pain or fatigue. Recently, Novilase received European approval (CE Mark) as the first thermal ablation device for breast cancer as well as benign breast tumors. It also received Food and Drug Administration (FDA) 510(k) clearance for the treatment of benign breast tumors and ablation of soft tissue. An IDE approval was granted by the FDA to launch the BR-003 confirmatory study, which is anticipated to lead to US approval of the therapy for the focal destruction of malignant breast tumors within the next 2 years. Other tumor sites and indications are also being explored.

> "*Essentially, we are converting a knife to needle treatment of breast cancer, which is very significant……A significant number of breast cancers detected at an earlier phase of development may be treated in this manner."*

Dr. Dowlatshahi is named on eight US issued patents related to Novilase. In 2020, Novian Health was selected as one of the top 50 MedTech startup companies that are transforming the

healthcare industry by MedTech Innovator, the largest medical technology accelerator. Specifically, Novilase was chosen for its groundbreaking treatment of breast cancer.

RONNY DRAPKIN, PHD, MD (YEAR OF AWARD: 2010)

Dr. Ronny Drapkin is the Franklin Payne Associate Professor of Pathology in Obstetrics & Gynecology at the University of Pennsylvania. He is a physician scientist who received his PhD in biochemistry & molecular biology in 1996 and his MD in 1998, both from Rutgers University in New Jersey. His postdoctoral training is in anatomic pathology (Brigham & Women's Hospital, Massachusetts) and cancer biology (Dana-Farber Cancer Institute, Massachusetts). As Director of the Ovarian Cancer Research Center and Basser Center for Breast Cancer, he leads a multidisciplinary team in translating important biological principles discovered in the laboratory into clinically useful diagnostic and therapeutic tools. His own research program is focused on understanding the pathogenesis and genetic alterations that underlie the development of ovarian cancer.

> *"I started my own lab in mid-2007 and TMKF award was essential for my lab because it came before NIH funding and helped us develop the tools that were a catalyst for all our subsequent work."*

In 2010, Dr. Drapkin received an award from TMKF to define the role of the fallopian tube (FT) secretory epithelial cell in the pathogenesis of serous ovarian carcinoma. The project was highly successful and resulted in the development of a series of immortalized FT cell lines that he and his team used to identify novel oncogenes and model ovarian cancer at the molecular level. These novel cell cultures as well as animal models helped the team pave a path towards understanding the pathogenesis of this deadly disease. Historically, ovarian cancer was thought to originate in the cells on the surface of the ovary, but studies by the team and others groups showed that the majority of ovarian cancers actually emerge from the FT, which has been a paradigm shift in the field, and approaches to the prevention and early detection of ovarian cancer were dramatically altered due to these findings. Notably, the FT cell lines developed by the team are now being used by investigators around the globe to study factors that drive ovarian cancer.

> *"The fallopian tube cells lines [that we developed] have really become work horses in the field. We have shared these cell lines with over hundreds of labs around the world. They have become a catalyst to helping us understand things that drive cancer development in the fallopian tube."*

The results of Dr. Drapkin's TMKF project led to an impressive number (9) of peer-reviewed papers as well as additional funding and numerous collaborations over the years. He is a highly respected authority in the field whose findings are reported regularly, nationally and internationally, through media outlets and whose achievements have been recognized through

multiple honors and awards. These include the 2011 Helene Harris Memorial Trust Traveling Fellowship (an exclusive group of thought leaders in ovarian cancer that meet every 4 years), an Elected Member of the American Society of Clinical Investigation (2016), and the Rosalind Franklin Prize for Excellence in Ovarian Cancer.

> "It has been really gratifying to see our work evolve over the years, from initial clinical observations at the research bench to ultimately back to the clinic, where we are making strides in changing the options for women at risk of developing ovarian cancer."

ANDREW EWALD, PHD (YEAR OF AWARD: 2013)

Dr. Andrew Ewald is a Professor of Cell Biology, Oncology, and Biomedical Engineering and Co-Director of the Cancer Invasion and Metastasis Program in the Sidney Kimmel Comprehensive Cancer Center at the Johns Hopkins University. He earned his PhD in biochemistry and molecular biophysics from Caltech and completed his postdoctoral training in epithelial biology and breast cancer research at the University of California, San Francisco. During his postdoctoral training, two of his relatives were diagnosed with breast cancer, which profoundly shaped his independent program of research to focus on developing cutting-edge imaging, genetic, and 3D culture techniques to study how cancers form and how they spread through the body to colonize distant organs. He seeks to apply this biological understanding of cancer to identify patients at the highest risk of recurrence and to develop novel therapies to prevent and treat metastasis. This is achieved through a cross-disciplinary approach that utilizes collaborations with physicians (surgeons, pathologists, and oncologists), chemical and biomolecular engineers, molecular and cell biologists, applied mathematicians, and materials scientist to identify the most clinically important steps in cancer progression and to develop new tools to identify targets for novel anti-cancer therapies.

> *"At the very moment I needed it the most, The Mary Kay Foundation supported me and approved my grant. As a consequence, we were able to publish papers, recruit the next generation of scientists, and quite literally change how the scientific community understands cancer metastasis."*

In 2013, Dr. Ewald received funding from TMKF to determine how basal marker positive cancer cells lead collective invasion and dissemination across multiple subtypes of breast cancer. The project was extremely successful. He and his team established that cells with a conserved basal molecular phenotype lead invasion and metastasis across subtypes of breast cancer, that the cells can invade and disseminate while retaining an epithelial phenotype, and that adherent clusters of cancer cells invade and circulate collectively to form multiclonal metastases. They also developed imaging, genetic, and 3D organoid culture techniques to enable real-time analysis of the cell and molecular dynamics in breast cancer. The findings resulted in three peer reviewed papers as well as additional funding and cross-disciplinary collaborations to bring together live culture of tumors with the cutting-edge imaging and genetic techniques to study

cancer invasion and metastasis in real-time that continue to this day and led to research independence and promotions of several team members.

> *"With the real-time technology I developed, we can now evaluate cancer cell by cancer cell, as the cells accomplish the fundamental tasks of metastasis, as they invade into the surrounding tissue, enter and exit blood vessels, and form new tumors while evading the immune system."*

Dr. Ewald is internationally recognized as a leader in the field for his research on the molecular mechanisms of cancer invasion and metastasis. He has given over 100 invited lectures, including as a speaker at the Nobel Foundation Conference on Cancer Metastasis in Stockholm, Sweden, and has received numerous honors and awards from diverse societies and foundations in recognition of his accomplishments. Key among them are an American Association of Anatomists Morphological Sciences Award for outstanding contributions to the field of epithelial morphogenesis, a Keith R. Porter Endowment for Cell Biology Fellow for exceptional contributions to cell biology, a Society for Photo-Optical Instrumentation Engineers: Systems Biology Pioneer Award for development of epithelial organoids as a platform for tissue level systems biology, and a Metastatic Breast Cancer Network Research Leadership Award for expansion of the basic understanding of the biology of metastasis.

> *"Andrew Ewald is at the vanguard of a generation of scientists determined to uncover the complexities of cancer."*

HUI FENG, MD. PHD (YEAR OF AWARD: 2016)

Dr. Hui Feng is an Associate Professor of Pharmacology & Experimental Therapeutics at the University of Boston School of Medicine in Massachusetts. She received an MD in 1994 from Beijing Medical University in China and a PhD in cellular biology in 2002 from the University of Georgia. Her postdoctoral training is in cancer biology, during which time she made several seminal discoveries in the field through the development of zebrafish models of MYC-driven cancer and genome-wide genetic screens, which led to the identification of novel contributors to MYC-driven tumorigenesis. Since establishing her own research laboratory, Dr. Feng's focus has been on combining analyses of human cancer cells and animal models for mechanistic studies and therapeutic evaluation of novel mediators of MYC-driven cancers, which she achieves through cross-disciplinary collaborations. In 2016, she received an award from TMKF to study targeting elevated S1P1 signaling as a novel therapeutic approach for triple-negative breast cancer.

> *"This is part of the genius of Hui Feng. The zebrafish can model human systems, and using them allows her to do pharmacological and genetics work quickly and relatively cheaply. [In addition], the zebrafish has the advantage of being particularly transparent,*

so we can really look inside the tissues in a live animal and see how the cancer spreads. In that aspect, the zebrafish is a perfect model to study cancer."

Prior to receiving TMKF funding, Dr. Feng had no experience in breast cancer research, and the funding allowed her to move her research in to the realm of breast cancer. Utilizing her unique expertise with the zebrafish model, she was able to establish zebrafish xenograft models of triple-negative breast cancer (TNBC). The research led to new and important insights into the disease mechanism and potential therapeutic approaches for aggressive TNBC with a particular genetic alteration. It also led to the discovery of an FDA approved drug, indicated for other diseases, that effectively inhibited breast cancer metastasis. Dr. Feng is hopeful that the findings will change how TNBC patients with this type of genetic activation are currently treated by indicating the inclusion of a targeted therapy with the standard therapy.

"Feng's strategy is twofold. Scientists in her lab look for genes, biological pathways, and molecules that impair MYC-driven cancer cells, while leaving normal cells alone. She and her colleagues are also teasing apart the basic process of metastasis: how cancer cells enter blood vessels, travel through the body, and take hold elsewhere. The zebrafish are critical for both lines of research."

Not only did Dr. Feng's TMKF funded project allow her to expand her program of research, but it also resulted in cross-disciplinary collaborations, multiple publications, and additional research funding. Her extraordinary achievements have been recognized through numerous honors and awards, including fellowships from the Cancer Research Institute and the Leukemia & Lymphoma Society, Ralph Edwards Career Development and Wing Tat Lee Endowment Professorships, and St. Baldrick Career Development Scholar, American Cancer Society Scholar, and R01 Awards. Dr. Feng is a dedicated mentor and has trained a number of predoctoral and postdoctoral fellows, whose achievements have also been recognized by multiple awards. As an internationally recognized expert in zebrafish models, she currently serves on the board of directors for the Zebrafish Disease Model Society and is a co-leader for a drug development and discovery research interest group.

"To better understand metastasis, Feng is also looking beyond biology into engineering and physics……. [Such]interdisciplinary collaboration, [she believes], may hold the key to understanding cancer."

MELISSA HERBST-KRALOVETZ, PHD (YEAR OF AWARD: 2017)

Dr. Melissa Herbst-Kralovetz is an Associate Professor of Basic Medical Sciences and Obstetrics & Gynecology and Director of the Women's Research Program at the University of Arizona College of Medicine, Phoenix. She received her PhD in biomedical sciences/experimental pathology in 2006 from the University of Texas Medical Branch. Her post-doctoral training was in mucosal vaccinology, and she has since continued to build her expertise and research

program in the arena of reproductive biology and host-pathogen interactions to enhance women's gynecologic and reproductive health. Dr. Herbst-Kralovetz received an award from TMKF in 2017 to fund her innovative research on the genital microbiome and local immune microenvironment in endometrial cancer patients, an understudied area. While still in the early phases of the award cycle, her clinical protocol optimization analysis has already revealed that vaginal and endometrial samples may contain distinctive microbiomes. The long-term goal of the promising research project is to integrate clinical and molecular information to better understand the role of the genital microbiome in the biology of inflammation and type I endometrial cancer as a means for risk reduction, with a view to identifying unique microbial signatures that could lead to new diagnostic, preventative, and/or therapeutic strategies.

> *"[Our research] on the role of the microbiome in endometrial cancer is high risk and a bit paradigm shifting, and up until The Mary Kay Foundation award, we had not been successful in capturing funding…….With the funding, we have been able to create a really rich patient repository that we can draw on in future years for additional funding."*

Dr. Herbst-Kralovetz published two review articles in *Frontiers in Immunology* (2018) and *Nature Review Urology* (2020) on the role of the microbiome in gynecologic cancer that outlined her future research directions related to the uterine microenvironment. She anticipates a minimum of two high impact original research manuscripts resulting from TMKF funded work. Further, the research funded by the foundation has led to cross-departmental clinical and bioinformatic partnerships and collaborations to promote and preserve the translational nature of her research as well as additional funding. She and her cross-disciplinary team continue to build on their initial findings and momentum to better understand the role of specific bacteria in influencing the hallmarks of cancer, specifically in the cervicovaginal and endometrial microenvironments.

> *"If we know what bacteria might be acting as drivers or passengers in the formation of cancer, we can study them as individual species or as bacterial communities to understand how they alter their local microenvironment. Identifying drivers of cancer will allow us to use those microbial signatures as potential risk factors for the development of endometrial cancer."*

In September 2018, Dr. Herbst-Kralovetz was named as one of three extraordinary female scientists at the University of Arizona who are leading research breakthroughs in the healthcare field. She is passionate about developing and mentoring women in science, and her nationally recognized research program has begun to receive international attention, most notably at the Global Health Keystone Symposium in South Africa. She was also presented a Phoenix Business Journal "40 Under 40" award, which celebrates leaders that make a difference in their organizations and community. She receives frequent invitations to speak nationally and internationally, serve on expert review panels for the National Institutes of Health, and conduct media interviews.

"I am a female scientist, but I am also a mother, daughter, and wife. Each role complements the other. I am a better scientist because I am a mother and vice versa. I teach my mentees that they don't need to choose one role over the other. It is imperative that we teach our young women that science and medicine need our collective voice, passion, ideas, and leadership."

LEAF HUANG, PHD (YEAR OF AWARD: 2005)

Dr. Leaf Huang is the Fred Eshelman Distinguished Professor in the Division of Pharmacoengineering & Molecular Pharmaceutics at the University of North Carolina at Chapel Hill. He received his PhD in biophysics in 1974 at Michigan State University and his postdoctoral training in biochemistry and biophysics at the Carnegie Institution of Washington in Maryland. He then went on to establish his independent research laboratory, where he has devoted his career to drug/gene delivery. He and his team have been pioneers in non-viral gene delivery since the mid 1980s—the cationic liposomes used in the first human clinical trial for non-viral gene therapy in 1992 were designed and manufactured by the team— and in recent years, their focus has been on the delivery of oligonucleotides, including siRNA using self-assembled nanoparticles, which the team also invented. Even more remarkable, the team discovered that the core of the nanoparticles could be replaced with a pH-sensitive calcium phosphate precipitate, such that the nanoparticles dissolve rapidly in the endosomal acidic pH of cell cytoplasm to release their cargo.

"We have developed a large tool box for the intracellular delivery of impermeable macromolecules."

In 2005, Dr. Hang received an award from TMKF to work on a therapeutic vaccine for cervical cancer. As a result of the funding, he and his team developed an effective peptide-based vaccine (PDS0101) for treating cervical cancer in a mouse model, the ingredients of which were simplified to just a peptide (the antigen) and a cationic lipid (the adjuvant). To the team's knowledge, PDS0101 is the simplest vaccine formulation for treating cervical cancer. The team also initiated the translation of the vaccine candidate, PDS0101, to the clinic, and in 2006, co-founded a biotechnology company, PDS Biotechnology, Inc., which is currently testing the vaccine in a Phase 2 clinical trial.

"Based on our discoveries, we founded PDS Biotechnology, Inc., a company whose focus is on a new generation of multifunctional cancer immunotherapies."

The results of Dr. Huang's TMKF funded project resulted in an impressive number of 8 peer-reviewed papers, which placed him in an excellent position to further explore the potential of nanotechnology in drug/gene delivery. His exceptional achievements have been recognized through numerous honors and awards, including elected fellow at the American Institute for Medical and Biological Engineering, the Alec D. Bangham MD FRS Achievement Award (highest

scientific recognition in the liposome field), the Distinguished Pharmaceutical Scientist Award from the American Society of Pharmaceutical Scientists (the highest scientific recognition from the society), and Chair of the Gordon Research Conference on Cancer Nanotechnology. He was named a highly cited researcher 4 years in a row (2016-2019) by Thomson Reuters and then by Clarivate Analytics.

> *"This [proved to be] a very fruitful collaboration with The Mary Kay Foundation, for which I am thankful."*

LAURIE LITTLEPAGE, PHD (YEAR OF AWARD: 2015)

Dr. Laurie Littlepage is the Campbell Family Associate Professor of Cancer Research in the Department of Chemistry and Biochemistry and at the Harper Cancer Research Institute of the University of Notre Dame in Indiana. She received her PhD in cell and developmental biology in 2003 from Harvard University, Massachusetts. Her postdoctoral training in cancer biology and the tumor microenvironment was conducted at the University of California, San Francisco. In 2012, she moved to the University of Notre Dame to establish her independent research laboratory. Dr. Littlepage's research program is focused on how tumors evolve over time within physiological microenvironments in response to treatment and at the metastatic site. Her collaborative and multi-disciplinary research is uncovering how cancer progresses and in identifying targeted therapies that prevent or reverse cancer in patients.

> *"Getting The Mary Kay Foundation funding was a critical step in my career. It supported my independence as a junior faculty member, and it signified an early success that I achieved towards developing my research program."*

In 2014, Dr. Littlepage was awarded funding from TMKF to investigate the role of ZNF217 as a prognostic indicator of chemotherapy resistance and self-renewal during breast cancer. The study was successful in that it not only identified ZNF217 as a new gene that is responsible for promoting chemotherapy resistance in breast cancer to endocrine therapy, but also identified the use of triciribine followed by paclitaxel as an effective treatment schedule for tumors that overexpress Zfp217. Since more than 70% of breast cancer patients have tumors that express estrogen receptor and are candidates for endocrine therapy and resistance, these findings and the treatment strategy have real relevance to patients. An impressive number (8) of peer-reviewed publications resulted from the funding as well as preliminary data that supported a large American Cancer Society Research Scholar Grant. Even more significantly, the preclinical experiments formed the basis of the design of an ongoing Phase 2 clinical trial that is evaluating the compound triciribine, which targets cells that express the gene Zfp217, and the team is now running preclinical studies to determine if triciribine may have efficacy against endocrine therapy resistance.

"This research has led to a much better understanding of how ZNF217 promotes resistance to both chemotherapy and endocrine therapy, both of which contribute to cancer progression and patient death."

Dr. Littlepage's outstanding achievements have been recognized through multiple awards, including a 2020 Inspiration Award from the American Cancer Society, the Campbell Family Associate Professor of Cancer Research Endowed Chair, a CTSI Young Investigator Award in in Clinical-Translational Research, and additional funding from the National Institutes of Health. She is frequently invited to give lectures on her work at scientific meetings, most recently at the Gordon Research Conference on Mammary Gland Biology in Mount Snow, Vermont, and is an active mentor to emerging scientists in the field, a skill that she developed during her postdoctoral training, with a particular emphasis on guiding female scientists early on in their careers.

"Since I was awarded the grant from The Mary Kay Foundation, one of my immediate family members was diagnosed with ER+ breast cancer. Now the disease is personal for me, and I am fiercely researching this disease with much hope of overcoming it."

BINHUA ZHOU, MD, PHD (YEARS OF AWARDS: 2009 & 2014)

Dr. Binhua Zhou is a Professor and the Madeline F. James Gardner Endowed Chair in the Department of Molecular & Cellular Biochemistry at the University of Kentucky College of Medicine. He received his MD in clinical medicine in 1986 from Guangzhou Medical University in China and his PhD in neuroscience in 1996 from the College of Pharmacy and Institute of Neuroscience at the University of Texas, Austin. However, his research interests abruptly changed from neuroscience (Parkinson's disease) to breast cancer research right before graduation after the sudden death of his beloved mother to metastatic breast cancer. Resolved to help find a cure for breast cancer, he joined the Breast Cancer Research Program at the University of Texas MD Anderson Cancer Center, where he pursued his postdoctoral training. Following that, he embarked on his own independent research program. Dr. Zhou's early studies contributed significantly to an understanding of the critical roles of the HER2/neu and PI3K/Akt signaling in the development and progression of breast cancer. Over the last decade, his studies have primarily focused on basal-like breast cancer (BLBC; also known as triple-negative breast cancer), which commonly occurs in younger women and has a tendency toward early metastatic spread to the brain and lungs, sites known to be associated with a poor prognosis and short survival. The overarching goal of his research program is to provide a clearer understanding of the biology of breast cancer and open new avenues for rational drug design.

"With the generous supports from The Mary Kay Foundation, our research has made a significant contribution to the understanding of breast cancer metastasis, and many of the supported studies have been published in top-tier journals."

Dr. Zhou is the recipient of two awards from TMKF. In 2009, he received funding to dissect the dysregulation of epithelial-mesenchymal transition (EMT) at breast cancer metastasis, and in 2014, he was funded to dissect the critical functions of the Dub3-Snail axis in basal-like breast cancer. Both projects were highly successful and resulted in a prolific number (20) of peer reviewed papers in top-tier journals. The team was the first to demonstrate that EMT is associated with metabolic reprogramming, which provides energetic fuels and biosynthesis intermediates for the growth and metastasis of triple-negative breast cancer, and identified that EMT is tightly associated with metabolic reprogramming. The team also discovered that a transcription factor binds to the second bromodomain of BRD4, which led to the recent development of specific BRD4 inhibitors that target the second bromodomain of BRD4. This work not only extended Dr. Zhou's program of research to epigenetic regulation and metabolic reprogramming, but also contributed to additional funding, collaborations, and Dr. Zhou's career progression.

> "A groundbreaking new study led by the University of Kentucky Markey Cancer Center's Dr. Peter Zhou found that triple-negative breast cancer cells are missing a key enzyme that other cancer cells contain–providing insight into potential therapeutic targets to treat the aggressive cancer. Zhou's study is unique in that his lab is the only one in the country to specifically study the metabolic process of triple-negative breast cancer cells."

Dr. Zhou's ground-breaking findings have been disseminated through public news outlets and national and international presentations. A celebrated leader in the field, his achievements have been recognized through numerous honors and awards, including a Tuition-Waived Fellowship form the University of Texas, a SPORE Career Development Award, and an Alexander Wang Memorial Award from the Society of Chinese Bioscientists in America, Texas Chapter. In addition, he is a regular grant reviewer for the National Cancer Institute and Department of Defense and serves as an editor for journals such as *Cancer Reports, the American Journal of Cancer Biology, and the International Journal of Biological Chemistry.*

> "This finding has significant clinical ramification, because drugs that can target the Twist-BRD4 interaction provide a new hope for treating life-threatening triple-negative breast cancer," said Dr. Zhou."

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APPENDIX

THE MARY KAY FOUNDATION GRANTEE SURVEY

Thank you for your willingness to take this short survey to help The Mary Kay Foundation (TMKF) determine the historical impact that its grants have had on the cancer research field as well as the careers of the recipients.

Before beginning the survey, you will need to create the following documents for upload, as it is not possible to save your responses and return to complete the survey at a later time:

1. An NIH style CV with an asterisk denoting any research publication that was supported by TMKF funding

2. Any stories, letters, acknowledgements, anecdotes, etc., that illustrate the positive impact that TMKF funding has had on human lives. These will need to be combined and uploaded in a single document format

For questions requiring written comments, please try to limit your response to no more than 5 sentences using layman's language for a non-scientific audience.

* Denotes all questions for which answers are required.

ABOUT YOU

1. What is your name? *
   - Open text box

2. What is your current place of work?*
   - Open text box

3. What year did you receive funding from TMKF (select all that apply)?*
   - Pull down menu listing 1997 to 2018

4. What was your position at the time of grant receipt? *
   - o Assistant Professor
   - o Associate Professor (Non-tenured)
   - o Associate Professor (Tenured)
   - o Professor

5. What is your current position?*
   - o Assistant Professor
   - o Associate Professor (Non-tenured)
   - o Associate Professor (Tenured)

- Professor
- Emeritus/Retired
- No longer in the academic field

6. Please upload a current (within the past year) copy of your NIH style CV with an asterisk denoting any research publication that was supported by TMKF funding.*
   - Upload box/button

7. Would you be open to TMKF reaching out to you personally regarding any of the above responses for potential future media features, testimonials, expert input, or otherwise?*
   - Yes
   - No

RESEARCH PRODUCTIVITY

1. What were the main objectives and outcomes of your research project(s)? Please provide a description of each outcome and whether or not the goal was achieved.*
   - Open text box

2. Did your research project(s) lead to any scientific publications, white papers, closed access publications or non-peer reviewed research articles?*
   - Yes
   - No

   If you selected yes, how many?
   - Open text box

3. Did the findings of your research project(s) lead to additional research funding?*
   - Yes
   - No

   If you selected yes, please list all research awards, amount funded and funding agency that were secured using the findings of your TMKF funded project(s).
   - Open text box

4. Did the findings of your research project(s) lead to any research collaborations?*
   - Yes
   - No

   If you selected yes, describe the nature of the collaboration(s) that resulted from your TMKF funding.
   - Open text box

RESEARCH IMPACT

1. Did the findings of your TMKF award(s) challenge an existing paradigm or lead to the development of a new paradigm?*
   - o Yes
   - o No

   If you selected yes, describe the impact of your discovery on the field.
   - Open text box

2. Did the findings of your TMKF award(s) result in the development of a new approach/technique/technology?*
   - o Yes
   - o No

   If you selected yes, describe the impact of the approach/technique/technology on the field.
   - Open text box

3. Did the findings of your TMKF award(s) lead to a seminal finding that shaped the subsequent course of research in the field?*
   - o Yes
   - o No

   If you selected yes, describe the impact of your finding on the field.
   - Open text box

4. Have the findings of your TMKF award(s) been translated directly or indirectly into the clinic?
   - o Yes
   - o No

   If you selected yes, describe how the findings of your project(s) have been translated directly/indirectly into the clinic and the impact they have had on cancer patients.
   - Open text box

CAREER PATH

1. Was the funding that you received from TMKF critical to your career progression?*
- o Yes
- o No

If you answered yes, describe the impact of the funding on your career progression.
- Open text box

2. Did the findings of your TMKF funded project(s) shape the course of your research program, such as which hypotheses, topic area, or research questions you went on to address, or an unexpected finding that changed the course of your subsequent research?*

- Yes
- No

If you answered yes, describe how the findings of your project(s) shaped the course of your research program.

- Open text box

- Did the funding lead to a prestigious accolade, national or international board affiliation, or scientific service?*
- Yes
- No

If you answered yes, list the accolade/board affiliation/scientific service below.

- Open text box

3. TMKF is interested in learning how its funding has had a positive impact on human lives over the past 25 years. Please share any stories, letters, acknowledgements, anecdotes, etc., that illustrate this impact. These will need to be uploaded in single document format.
   - Upload box/button