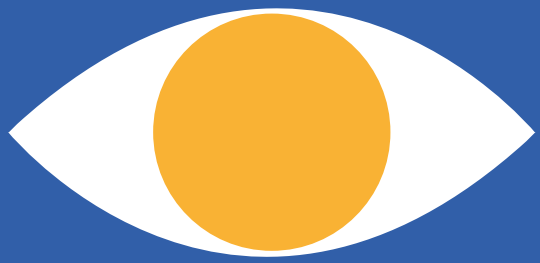
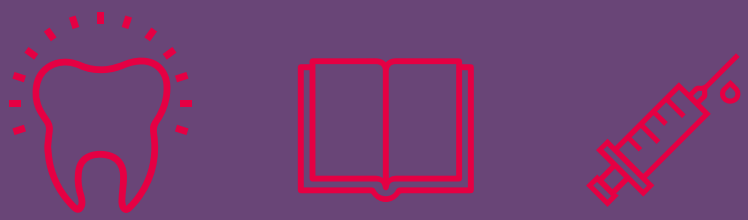
UANDES INNOVATION

2016·2019

ENGLISH VERSION





Universidad de los Andes 30 años

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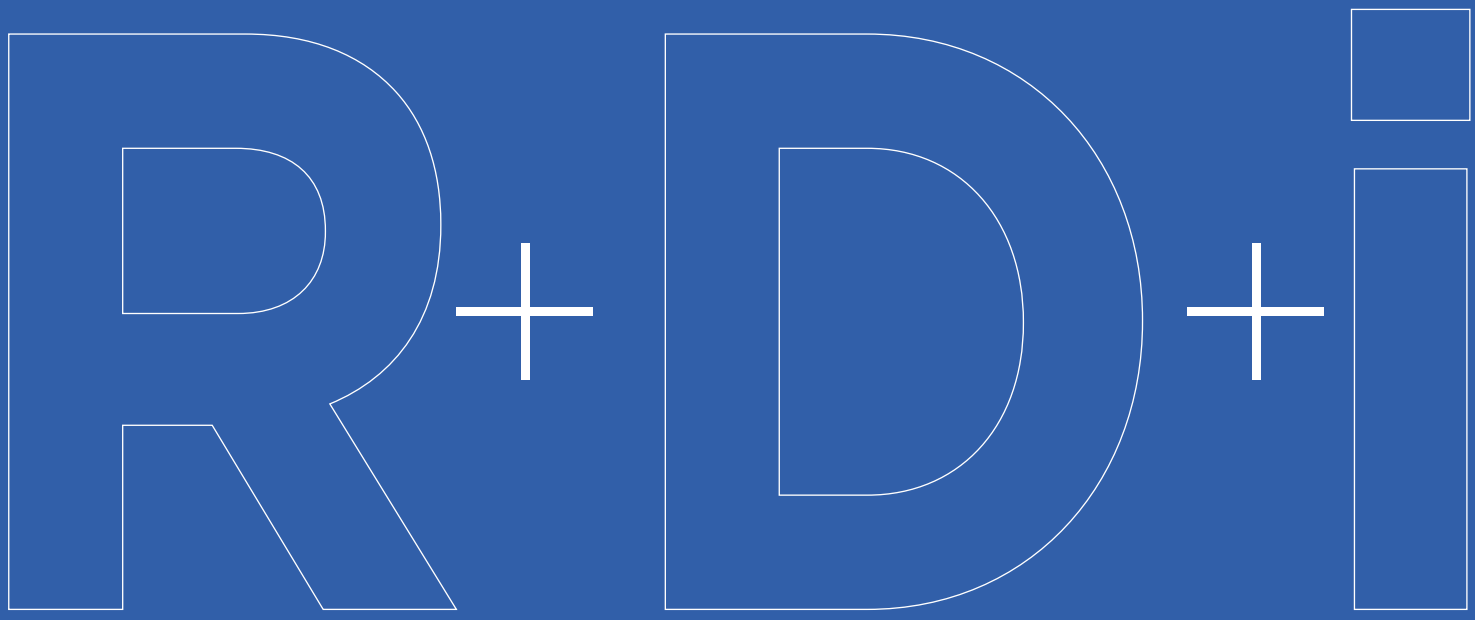
INNOVATION DEPARTMENT

2016·2019

Universidad de los Andes 30 años


R+D+i

“Innovation distinguishes between a leader and a follower”

Steve Jobs

Co-founder and CEO of Apple Inc.

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"Innovation is discovering new or improved uses for the resources we already have".

Peter F. Drucker,

Writer and philosopher

01

Innovation Department

Photography: María José Pedraza

CHILE IS OPENING UP TO INNOVATION

Chile is a South American country with a population of 18-million, its capital is Santiago. Located between the Pacific Ocean and the Andes mountain range, limiting with Argentina, Peru and Bolivia.

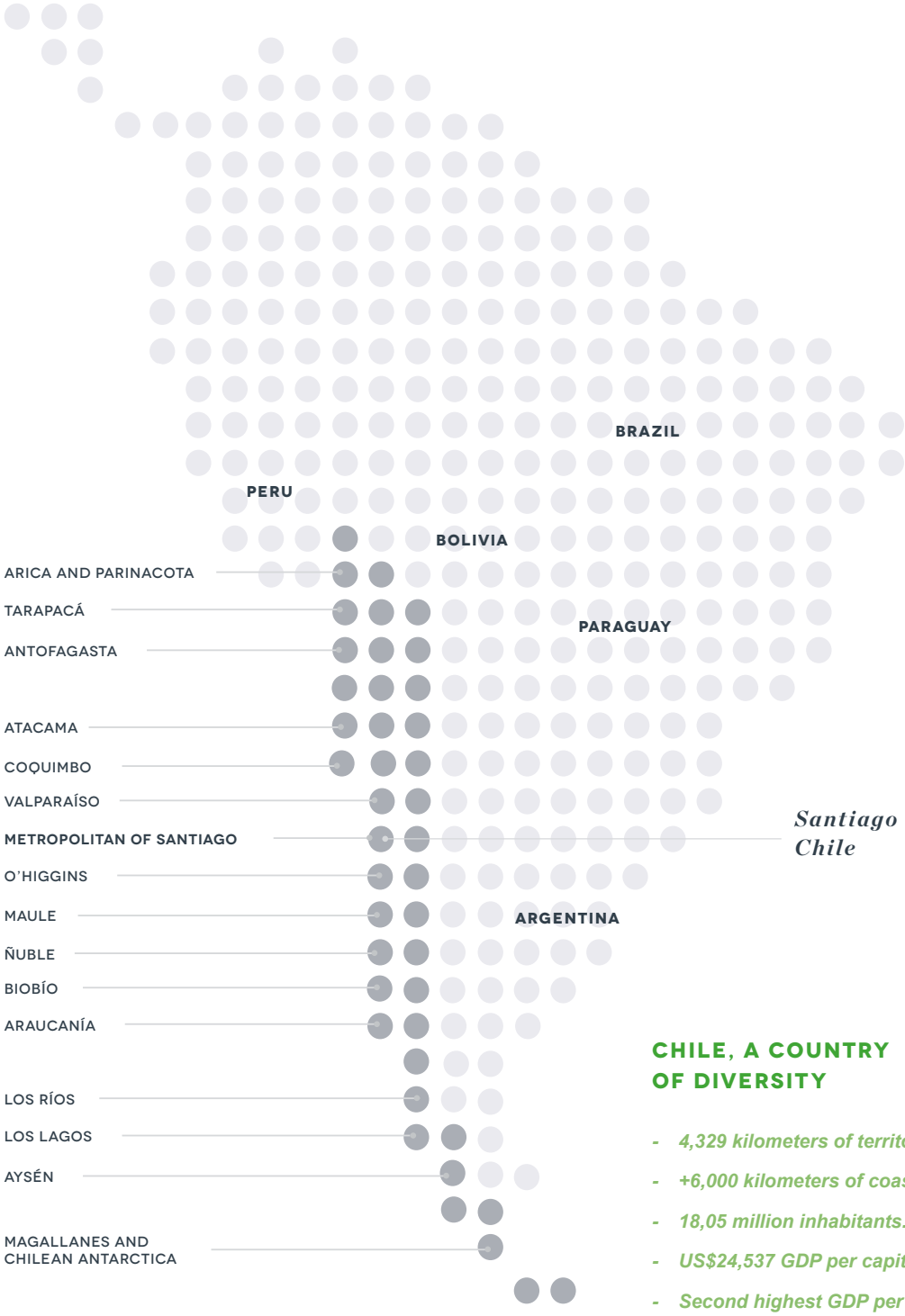
It is the longest country in the world, with over 6.400 kilometers of coast, mountains, valleys, islands (Chiloé, Easter Island, Juan Fernández Archipelago, San Félix Islands, San Ambrosio and Salas y Gómez), glaciers, and the world's driest desert, which covers an approximate 105.000 km^2. Chile is internationally recognized as a stable country, with solid institutions that work and generate confidence.

During the last 16 years, this country has sustained a consistent growth rhythm, being the place of most dynamic economy in the region, according to World Economic Forum data. It is also known as one of the best countries to develop a business, according to most international measurements.

Historically, Chile has been recognized as a county whose growth is based on prime matter exportation, with copper as the leading export product. However, in the last few years, efforts have been made to evolve from an extractive economy to more knowledge-based one.

Government iniciatives such as CORFO (Corporation for Production Development) ought to be recognized for their efforts in developing chilean innovation. This Chilean governmental agency depends on the Ministries of Economy, Development and Tourism, and is in charge of supporting entrepreneurship, innovation and competitivity in the country, as well as strengthening human capital and technological capabilities.

Likewise, the recent creation of a Ministry of Science, Technology, Knowledge and Innovation, in charge of structuring, boosting, coordinating and promoting science, humanities and technological development activities in all their stages, aims to contribute to the country's sustainable development and social wellbeing.



CHILE, A COUNTRY OF DIVERSITY

- *4,329 kilometers of territory.*
- *+6,000 kilometers of coast on the Pacific Ocean*
- *18,05 million inhabitants.*
- *US$24,537 GDP per capita in 2017.*
- *Second highest GDP per capita in Latin America.*
- *US$277,000 million annual GDP in 2017.*
- *The Government supplies US$1,000 million annually for Innovation and Development.*
- *3rd largest fresh water reserve in the world.*
- *Houses de world's clearest skies.*
- *30% of the world's copper production is Chilean.*
- *Copper collaborates with 9% of national GDP.*
- *Chile possesses 54% of the world's Lithium reserves.*
- *A 20% growth in Lithium demand is expected over the next five years.*
- *4th largest wine exporter in the world.*

UNIVERSIDAD DE LOS ANDES

UANDES was accredited in all areas by the CNA (valid through December 2022)

Universidad de Los Andes (UANDES) is a private, nonprofit university, based in Santiago. It offers more than 40 undergraduate and bachelor's degrees, 38 post-graduate and specializations in areas such as Health, Law, Education, Engineering, and Humanities, and 220 continued education programs, which gather around 15.000 students.

Since its beginning, UANDES has developed research in diverse disciplines, and, since 2010, has made special efforts towards the generation of innovation.

Within the Chilean university system, UANDES stands in third place (2018) in the recruitment of students who have achieved the highest scores on the national university entrance exam, PSU. The university has been accredited for five years in all areas susceptible to this certification by the National Accreditation Commission (CNA). Likewise, it is accredited as a Center of Innovation and Development (I+D) by CORFO, which, in turn, generates a benefit for private investment in Innovation (I+D Law).

Central Building

WORLD-CLASS CAMPUS

- *54 acres of campus.*
- *ESE Business School of postgraduate and executive education.*
- *University Clinic (56,000 square meters, 8 floors, 117 beds).*
- *Laboratories and Research and Innovation centers.*
- *87 international agreements with institutions in 24 countries.*
- *12,000 square meter library.*
- *Museum of Art and Cultural Extension.*
- *Interior and exterior sports facilities, and a great variety of extracurricular activities.*
- *AlumniUANDES association with over 16,765 alumni and donations towards student scholarships.*

INNOVATION DEPARTMENT

Three R+D+i pillars

Interrelated Entities	Pillars	Work areas		
FACULTIES GOVERNMENT COMPANIES	RESEARCH AND PROJECTS	Research	· *Research centers and Faculties* · *Clinical fields* · *National universities* · *International Universities*	
		Projects	· *Public funding* · *Private funding* · *International funding*	
FACULTIES COMPANIES	TEACHING	Entrepreneurship	· *Spin-offs* *Incubator/Accelerator* · *Social Innovation Institute*	
		Minors	· *Undergraduate students*	
		Diploma and Masters in Innovation. Biomedicine PhD.	· *Professionals and postgraduate students*	
GOVERNMENT COMPANIES	TECHNOLOGY TRANSFER	Technological transference office (TTO)	· *TTO services*	· *Intellectual property* · *Transference strategies* · *Technological Portfolio* · *International Consultancy*
			· *Angel Investor Network*	· *ESE Business School*
		Strategic partners	· *National*	· *Amcham* · *HubTec Chile* · *Traslacional Biology Center (CBT)* · *RedGT*
			· *International*	· *ATTP* · *Praxis-Auril & AUTM* · *UCL - B* · *Uniservices* · *TTS* · *Hoffmann Eitle* · *Singularity University*

Mission

We seek to coordinate, manage and connect society's needs to the applied research developed within the University, in order to generate a positive impact through concrete solutions and training capacities in education and sale of innovation services. We contribute to generating adequate conditions for creating value through innovation.

Vision

To be recognized and needed for our educational services in innovation, valuation and technological transference processes in Chile and South America.

JOSÉ ANTONIO GUZMÁN CRUZAT
President

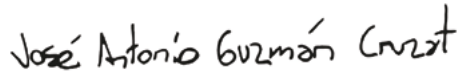
Innovation, a fundamental University pillar.

Almost one decade ago, Universidad de Los Andes challenged itself to become a relevant figure in the area of science-based innovation. It was a brave venture and, to make it happen, we decided, first, to create the Innovation Department. Two years later, we applied to the Institutional Improvement Plan (PMI) in Innovation, a part of the second version of the performance for innovation agreements with the Ministry of Education, which allowed us to escalate the work that we had been developing.

From those beginnings, our house of studies has taken an important leap in the areas of research and innovation, which has translated into a series of publications and technologies developed by the Faculties of Education, Medicine, Dentistry, and Engineering and Applied Sciences. With top-notch infrastructure and collaborative interdisciplinary human teams, the University has been able to position itself as a reference, among our peers and on a national level, in the field of sciences and technological transference.

Today, we have the great opportunity and the challenge of assuring that our development and research achieves a high impact, provides social value, and endures in time. Our Strategic Institutional Planning 2017-2021 (PEI) depicts these goals, for innovation and research form a part of the five guidelines on which our roadmap is based.

On a personal level, I am deeply thankful to everyone who has trusted in our institution and made this work possible.



RESEARCH FOR SERVICE OF SOCIETY

LUIS ALEJANDRO SILVA

Vice President of Research and Postgraduate Programs.

Our new report from the Innovation Department reflects the increasing maturity which has been gradually acquired in a barely exploited area within the national university system. Innovation, in general, is a gear that enriches academic work, for many reasons.

What we have experienced at Universidad de Los Andes is that innovation opens a virtuous circle of creativity and collaboration that leads to sounder teams, a reciprocal recognition of the various intervening parts (public-private, academic-company, theory-practice), and a cycle in which innovation and research give each other constant feedback.

With our eyes set on the future, there is much more to be done. But we want to celebrate our achievements as well.

The public tenders awarded, the private funds leveraged, the new spin-off, the outreach courses, etc., all give account of the perseverant and demanding work that has been done. When we project these results towards the future, we glimpse an area laden with rewards and new challenges.

This report collects facts, numbers, titles and projects… But what matter smost are the people whose work explains those results. Take, therefore, this summary of innovation activities as a grateful recognition towards the daily task of the whole Department team: Anil, Danilo, Silvana, Patricia, Ariel, M. Fernanda, Clara, Javiera and Alejandro. Extend thanks to the researchers and their work teams, as well as all who have in some way contributed to the development of innovation within our University.

ANIL SADARANGANI

Director of Innovation

Early diagnosis and intervention in pregnancy diseases, such as gestational diabetes and premature delivery; using extracts of salmon skin as input for printing human organs; developing a bio-device to filter air inside homes in highly contaminated areas. These are a few of the innovative technologies that Universidad de Los Andes has been developing from research carried out in the same house of studies. In addition to these works, which will very soon be available to the public, various academic programs are offered. Among them, two programs stand out: the Minor in Innovation for undergraduate students, and the Masters in Research and Innovation in Dental Sciences. These programs were partially financed by the Mecesup Institutional Improvement Plan (PMI), awarded in 2013 to our house of studies and which resulted in an important advance in results and a strong impact in innovation in teaching, research, and technological transference.

In this report we would like ilustrate the work of our researchers in close collaboration with important academic centers and world class R+D+i, such as Harvard University, which has contributed to our recognition by different organisms, and been awarded by CORFO on two occasions.

In name of the Innovation Department, I'd like to thank the permanent support that the authorities of our University have offered us, that they've invested into research and innovation as one of the most relevant and central thrusts of the Strategic Institutional Planification. Without their support, added to the commitment and professionalism of our work team, along with the labor of our researchers and boards of our academic units, as well as the administrative teams that have been involved in satisfactorily managing our resources, we could not have achieved the progress that we have before us today.

We will continue with renewed perseverance, for we are convinced that we will conquer great successes in terms of technology and positioning Universidad de Los Andes on an international level.

TTO UANDES
CONQUERS THE MARKET

The Technology Transfer and Licensing Office oversees that the developed technologies are successfully transferred to society.

If we had to describe the Technology Transfer and Licensing Office (TTO), we'd say it is the articulator or bridge between the University's applied research and our strategic partners in the different industries at which UANDES technologies aim, and whose function is to make a positive impact on society in a way that can be adopted by the market.

The objective of the TTO is to strategically support researchers to develop technologies towards an imapct in our society. Silvana Becerra, Vice Director of Technological Development and Marketing of the UANDES Innovation Department, explained that the idea is that research results create value. "To achieve this, the TTO's work is essential, because it possesses the internal capacities and networks that are able to boost and validate these processes towards reaching the market and transferring the technology". In Silvana Becerra's opinion, the model applied in this office has been considerably successful, since the TTO works directly with the researcher when it is determined that the work is potentially developable. "The UANDES R+D+i model is activated when a technology is presented to us and we analyze its potential. This includes performing preliminary market research, judging what aspects of the technology can be protected and, once the industrial protection strategy is defined, ensuring the correct evolution of the technology on its way to the market.

Innovation Department Team

Meanwhile, we train researchers in key themes, from intellectual property to how to present to an investment panel", she states.

The UANDES TTO has not only established itself among the UANDES faculties and researchers as a link between academia and market, but has also achieved recognition by other higher education institutions, some who have wisely requested advice in the process of forming their own technological transference offices, or those who have required counsel in matters of reaching the market with their technologies.

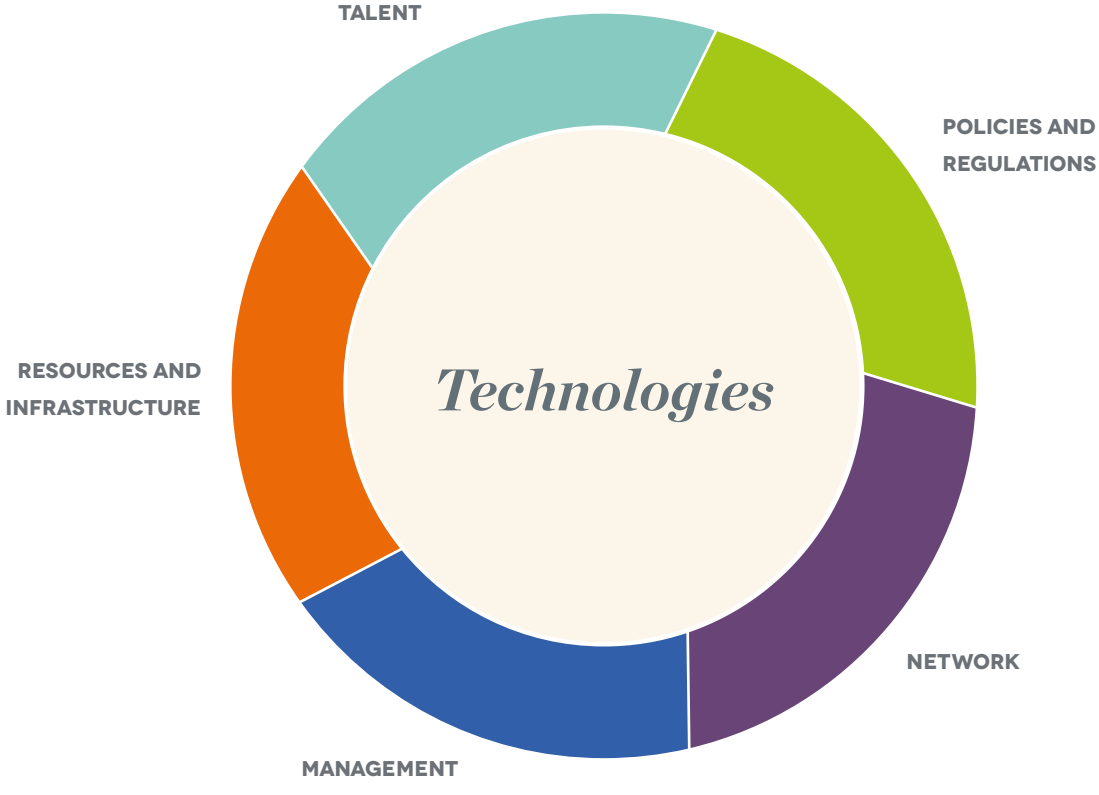
CHALLENGERS

The UANDES TTO has a few successful cases under its belt. Among the most outstanding are a forensic medical kit, a nut classification machine which uses artificial vision, and the development of diagnostic kit for early detection of pregnancy diseases.

Additionally, the TTO has been able to transfer technologies in other areas, such as those developed by the Faculty of Education, Dia+, licensed by Colegium. In Health, R.A.D.A.R stands out, a technology that aims to detect suicidal tendencies in adolescents.

Among our short-term challenges, we aim to position Gel'X, a biomaterial with diverse applications in food industry, salmon industry and tissue engineering, in the market.

UANDES MODEL
INCUBATOR



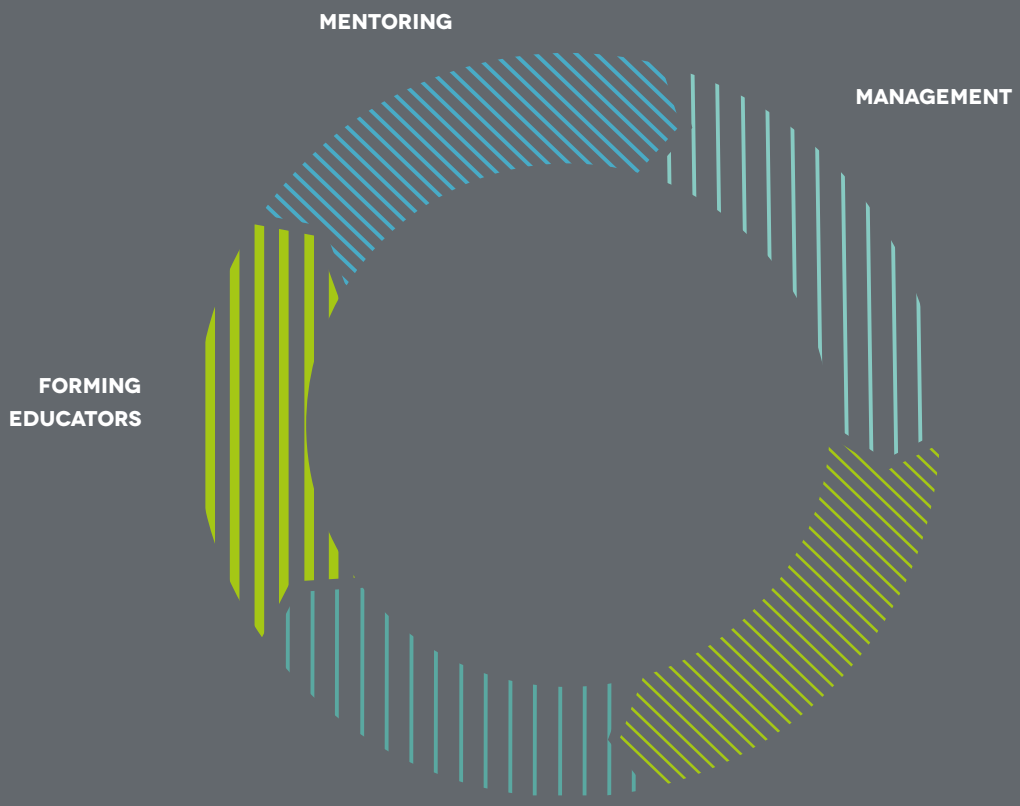
Fortifying our University's applied research transference, by means of an incubator that provides training, support and services, is the objective of the Innovation Department model.

The incubator process works in various steps. First, it seeks resources to support the application process for public funds and to approach to the private sector. Secondly, it promotes the construction of networks which, in turn, originate alliances with national and international centers of prestige, that validate the technologies and their development. It also creates intellectual property policies and regulations to protect the University and the researcher's interests. Finally, it manages the talent and the awarded funds to support researchers in their developments.

In turn, an accelerator has been formed, aiming to offer resources and mentorship to boost the various technologies' advance and safe arrival to society from the very beginning.

The objective of the Innovation Department's model is to be a bridge between science and the market, facilitating mutual understanding and assuring the synchronized advance of the interests of each of the parties involved.

ACCELERATOR



VICE RECTORY OF PROJECTS RESULTS
(IN CHILEAN PESOS)

2017–2018	**US ($)**
Public funds	2.406.948,0
Technological contracts	1.032.902,9
Private support	421.804,5
UANDES	782.796,4

FACULTIES THAT WORK WITH **R+D+i**

ANTONIO VUKUSICH
Dean of the Faculty of Medicine

The researchers at the Faculty of Medicine's Biomedical Research Center have made important contributions to innovation in various areas, such as physiology, immunology, neuroscience, cellular therapy and reproductive biology. For example, the research lines applied to the field of human reproduction have focused on the role that diverse factors play in prevalent pregnancy pathologies, and in the development of biomarkers for their detection and early control. In nutrition, important advances have been made in the comprehension of how structural changes in foods modify their nutritional value. Parallelly, in addition to the postgraduate students who develop their studies in our Faculty, our applied research has incorporated some undergraduate students in several areas.

JAIME ANGUITA
Dean of the Faculty of Engineering and Applied Sciences

Establishing a new area of research in bioengineering and being prepared for technological innovation have been two of the challenges that we have conquered with the help of the Innovation Department. In addition to those projects, we also aim to gain more experience in successfully applying for funds and in project execution, with our eyes set on the industry.

Today, we can proudly say that the Faculty has gained a wider perspective of science-based innovation and is actively working to transmit this to postgraduate students.

KARIN JÜRGENSEN

Dean of the Faculty of Economic and Business Sciences

Business majors fulfill their role when their work makes positive differences in people´s lives. In order to do so, innovation is essential. We strive to ensure that our professors, students and alumni develop innovative processes, services and products, that improve other's quality of life and job satisfaction.

This year, the Innovation Department has accompanied some of our Faculty's professors in their applications to public tenders, with excellent results. In turn, through the Innovation Minor, our students have generated innovative ideas to better serve society.

IGNACIO ILLANES

Dean of the Faculty of Education

Our Faculty has worked collaboratively with the Innovation Department because we'd like to prioritize applied research that offers real improvement tools for our teachers. We take great care that these developments be grounded on solid and well based theory, and that they improve learning so as to help each student be the best they can. Platforms such as Dialect, Diamat and Leer+ are concrete examples of solutions to real classroom problems that can be resolved with the best technology, efficiency, and common sense.

CRISTIÁN BRAVO

Dean of the Faculty of Dentistry

The Innovation Departments work has enabled us to accelerate the development of the research we had underway, and to make some service-oriented initiatives come to life. In the case of long-term projects, we have been awarded numerous initiatives which have been endorsed by CORFO and private companies.

INNOVATION DEPARTMENT
PAST RESULTS

FIRST
Innovation Hub in Chile

150
PROFESSIONALS WORKING AT R+D+i

45
UANDES TECHNOLOGIES IN DEVELOPMENT

7
Licenses

70
COMPANIES THAT PARTICIPATE IN THE UANDES INNOVATION NETWORK

62
COLLABORATION AGREEMENTS

4
SPIN-OFFS

84
PATENT
APPLICATIONS

+50
COMPANIES

US$ **60**
MILLION
raised by
R+D+i

18%
UANDES
TECHNOLOGIES
SPIN-OFF

20
ACTIVE
COLLABORATION
ARRANGEMENTS

FAIN, A MEAN OF SUPPORTING INTERDISCIPLINARY INNOVATION

During 2018, the first workshop to encourage research between CIIB researchers and the medical staff at Universidad de los Andes Clinic was carried out.

In the constant search to boost applied research within the University, the Innovation Department made the decision to promote a Fund to Support Innovation, FAIN, which will strengthen the work of the researchers towards technology transference.

The fund seeks three things: strengthen projects to increase the rate of allocation of public funds; establish a link with the university clinic, through initiatives that aim directly at improving the quality of life of patients; and accelerate technological transference to improve the strategic position of the technologies and/or adding partners key to their commercialization. With these objectives, during 2018, eight projects were presented.

The first UANDES Innovation Support Fund was proposed under three modalities. The first one was Applied Research, which aims to support well evaluated researchers in an applied research project that did not get financed by external competitive funds. The second is related to associative research with health centers, and seeks to promote researchers, doctors and healthcare professionals that wish to carry out associative research between the two entities to positively impact on the quality of patients' lives. And, finally, the pre-licensing, oriented towards backing the data for the commercialization of a technology and defining a strategy to reach the market.

INTEGRATING TEAMS

As a way of promoting integration and reaching potential investigations, a workshop among the doctors of different specialties of University of the Andes Clinic and the researchers of the Center of Biomedical Research and Innovation (CIIB) was carried out.

Dr. Claudia Campusano, Medical Vice-rector of the University of the Andes Clinic, valued this type of activities, something very common in other universities that have both research and clinics. The endocrinologist motivated doctors to take an interest in research and to take advantage of this instance, appreciating the synergies that can be achieved, since the cooperative work directly benefits patients.

Dr. Rogelio Altuzarra, former dean of the Faculty of Medicine of the University, stressed that research is the engine that moves the development of society and that the Faculty has had, from its beginnings, a clear research vocation. "Research is an inherent task of the University and there are many synergies that can be established. This meeting is an excellent opportunity for clinicians to get to know the work that is developed in the biomedical area, which allows for an exchange of ideas that can later take shape in joint research", said Altuzarra.

The initiative, organized by the Innovation Department and supported by the Faculties of Medicine and Dentistry, featured exhibitions on current projects in the areas of Neurosciences, Immunology, Reproduction, Cardiovascular, Regenerative Medicine, Tissue Engineering, Dentistry and Biomaterials.

FUND TO SUPPORT INNOVATION

NETWORK OF ANGEL INVESTORS:
A BET ON THE FUTURE

This initiative is the first of its kind born under the wing of a university and will allow companies to get involved in the development of technologies.

Javier Enrione, researcher at the School of Nutrition and Dietetics of the UANDES Faculty of Medicine; Iván Díaz-Molina, Director of the ESE Business School Center of Innovation and Entrepreneurship; Luis Alejandro Silva, Vice-Rector of Research and Postgraduate Studies UANDES and Anil Sadarangani, Director of Innovation UANDES.

The University, as part of its institutional development, has incorporated the link to society as one of its central themes, frequently known as the “third mission of the universities”. With this objective, the Innovation Department, in cooperation with UANDES ESE Business School, presented a technology to the UANDES Network of Angel Investors for the first time.

In front of more than 30 potential investors, the Faculty of Medicine researcher and professor, Javier Enrione, presented the Gel’X technology, a platform for using salmon by-products that are currently considered waste and revaluing them through uses in food and biomedical industry.

Luis Alejandro Silva, UANDES Vice-Rector of Research and Postgraduate Studies, highlighted the interest that the University’s investigations arouse and said that “you (the investors) are those who close the university’s cycle of technological transference; an important step for us, because it is a test that confirms that we are conducting research that is impacting society.”

The Angel Investors Network was created in 2016 to strengthen UANDES research, with the purpose of seeking funds to scale up the technologies and reach the market. The initiative, a pioneer in its type and born under the wing of a university, emerged after several conversations between the UANDES Innovation Department and Professor Iván Díaz-Molina, who runs the Center of Entrepreneurship and Innovation (CEI) of the ESE Business School.

ESE Business School

PMI: THE INSTITUTIONAL IMPROVEMENT PLAN IN SCIENCE–BASED INNOVATION

The Universidad de los Andes Institutional Improvement Plan (PMI) in innovation ended in November 2017 and, since that date, funding and sustainability was 100% passed on to UANDES, thus fulfilling Rectory's commitment with helping investigations follow their course.

PMI is an inniciative from the Ministry of Eduation that seeks to encourage Universities to grow in innovation, research and commercialization.

One of the accomplishments, for example, in the teaching area, was establishing a greater link with the university community, which resulted in the creation of the first Innovation Minor on a national level, with the participation of 250 Undergraduate students from different careers. Within the program, a specific opportunity stands out: the creation of projects that aim to guide students to think beyond their areas of knowledge and open their eyes to the possibility of a joint solution, which involves several disciplines: this is our students' first approach to the R+D+i world. Additionally, the first postgraduate course that creates bridges of research and innovation was established: the Masters in Research and Science-Based Innovation.

In the research area, three nuclei were strengthened: biomarkers, biomaterials and medical devices.
They obtained high impact results that were protected by patents. In addition, the installation of a cell culture lab was achieved, as well as the creation of the Bioengineering Center, which was conceived to scale up and validate laboratory developments on an industrial level.

It is important to highlight that, in order to strengthen the innovation culture, an increased effort was made so that researchers knew more about the generation of patents and intellectual property, in addition to encouraging them to dare, based on their scientific results, to develop products or services of interest to society and that, at the same time, generate a positive change in people's quality of life.

As for technological transference, the third focus of the plan, work teams and procedures for the Technological Transference Office (TTO) were consolidated, and TTO was recognized nationwide for its management in the years 2016 and 2017. This recognition is based on the UANDES licensed technologies, the generation of spin-offs, the private sector capital lifting and the increase in contracts related to the Innovation Department know-how in this matter.

For Anil Sadarangani, who was the director of this program, what is coming now is to persist with the conquered and improve it. "The task of the University is to continue promoting and developing applied research, to achieve introducing UANDES technologies in the market and generating impact".

The objective was to strengthen three areas within the University in the field of innovation: teaching, research and technological transference.

PMI Committee, composed of representatives of the Faculties of Dentistry, Medicine, Engineering and Applied Sciences, and authorities of the Innovation Department.

PMI: INNOVATION CATALYST

The opening of the grant by the Ministry of Education allowed three researchers from different areas, along with deans and directors, to come together to present an attractive project and allocate the US$ 3.431.709 that were available as resources to strengthen the institution.

To understand how the Ministry of Education awarded US$ 3.431.709 to Universidad de los Andes to finance the Institutional Improvement Plan (PMI), we must go back to 2012, when Matías Vial, who at that time led the Research Development unit - which later became the Innovation Department, brought up the existence of this state financing.

The idea was discussed with the researchers Maroun Khoury, Ph.D, Scientific Director of Cells for Cells and researcher at the Faculty of Medicine of University of the Andes; Juan Pablo Acevedo, Ph.D., senior researcher at Cells for Cells UANDES; and Sebastián Illanes, who was then Vice-Dean of Research at the Faculty of Medicine. “We evaluated if we had any areas in which different capacities came together to contribute towards a joint project. There were multiple meetings with Engineering, Dentistry, and the Departments of Innovation and of Research and Planning, to reach a consensus where we could complement those capabilities and project them towards the future to achieve a substantial quality jump.”, explained Illanes.

Finally, the plan was divided into three areas: Biomarkers, Engineering and Cell Therapy. “We wanted something multidisciplinary and that in a same project we could talk about the three areas what we propose. That could not be done with the amounts that we had individually, but required a bigger contribution, “said Khoury.

The contribution of US$ 3.431.709 allocated by the Ministry of Education was relevant to the investigations that the University was already doing, because it allowed them to move forward and accelerate the processes that were taking place. The three researchers recognize that without the PMI, the obtained results would not have been achieved. “This was important for human resources, which are very expensive; we know that an important part of the fund was allocated to hire high-level professionals and that was essential for the development of the projects and strengthening of the different teams”, stated Juan Pablo Acevedo.

Regarding the results obtained, the three researchers agree that “with the work teams, a PMI identity was generated”, where the people identified

The researchers Juan Pablo Acevedo, Maroun Khoury y Sebastián Illanes.

with the project, a plan that had very high pressure to live up to everything promised. “The fact that we were under the PMI umbrella meant an inertia, a pressure, to fulfill the assumed tasks and a catalyst so that the Technological Transference Office would gain the national relevance that it boasts today”, said Acevedo.

Although the PMI came to an end in November 2017, the projects continues. In the opinion of Khoury, what’s coming now is to move forward so that people and the market can see something tangible and not just ideas. “What we are going to see after the PMI is a much more avant-garde technology and that means it will be more interesting for the investors”, he said. For his part, Dr. Illanes assured that “what we must do is continue strengthening what has been achieved, incorporating scientists that are a contribution to the group that has already been formed”.

When making a personal assessment, the three researchers claim that it was a great opportunity and that if there was a PMI 2.0, they would apply again. “It was an opportunity for integration with several researchers and everything that had to do with science, application and market projection was fundamental and generated other ways to see the projects”, said Acevedo.

“For me, the PMI was important, because it was multidisciplinary, with international researchers, and came with a huge motivation to do it all right. That is the positive side, because there is also frustration, which has to do with the whole logistics part”, said Khoury.

“To gather a large group of people to elaborate the plan, coordinate relevant topics, participate in writing the project and then participate in its implementation and execution was a learning process that marks a before and after in the history of the research within our University”, Illanes explained.

PMI: THE RESULTS OF THIS PROCESS

The impact of the resources delivered by the State not only allowed a rise in all the indicators, but also enabled the positioning of Universidad de los Andes within the science-based innovation ecosystem.

In the three years in which the University benefited from the contributions of the PMI, great progress was made in research and innovation. Silvana Becerra, Vice Director of Innovation and PMI Sub-Director, stated that this is a tool that helped to raise standards at all levels and that achieved transcendence beyond the Bio scope, because it pushed towards the establishment of new and transparent processes necessary for management.

“In the scientific field the results are public, so PMI helped us in giving investigators more open minds and widening their focus from only generating knowledge and publish, to also addressing a market vision, where the Intellectual Property protection strategy is key, together with external consultants who validated our results, “said Silvana Becerra.

- **One of the remarkable results is the establishment of research lines which got additional financing through public and private tenders to strengthen research teams and develop robust technologies.**

- **These lines are collaborative between several laboratories of diverse expertise, allowing multidisciplinary approaches that enhance the obtained results.**

- **85% of the people hired during the PMI period continue to work in the University.**

- **There was a year by year upward trend in the number of scientific publications and in quality and frequency of citations.**

- **During the first two years of the PMI (2013-2014), more than 100 academics and researchers from the faculties of Medicine and Dentistry were trained in subjects of innovation.**

- **Six researchers specialized in Technological Transference issues in Chile and abroad.**

- **The portfolio of UANDES technologies increased four times. From nine technologies in 2013, it increased to 37. This represents 62% of the total University technologies.**

- **There was an equal contribution by the public and private sector. The general rule is that universities usually receive 80% state contributions and 20% private. At the University, these were 50%.**

- **Patent applications increased from 3 to 27, that is, nine times.**

- **Five clinical trials were approved in all four years of PMI.**

PMI NUMBERS

PMI PUBLICATIONS

	JOURNAL IMPACT FACTOR QUARTILE (Q1+Q2)	NUMBER OF PMI PUBLICATIONS
2013	55%	20
2014	55%	20
2015	88%	32
2016	78%	36
2017	74%	42

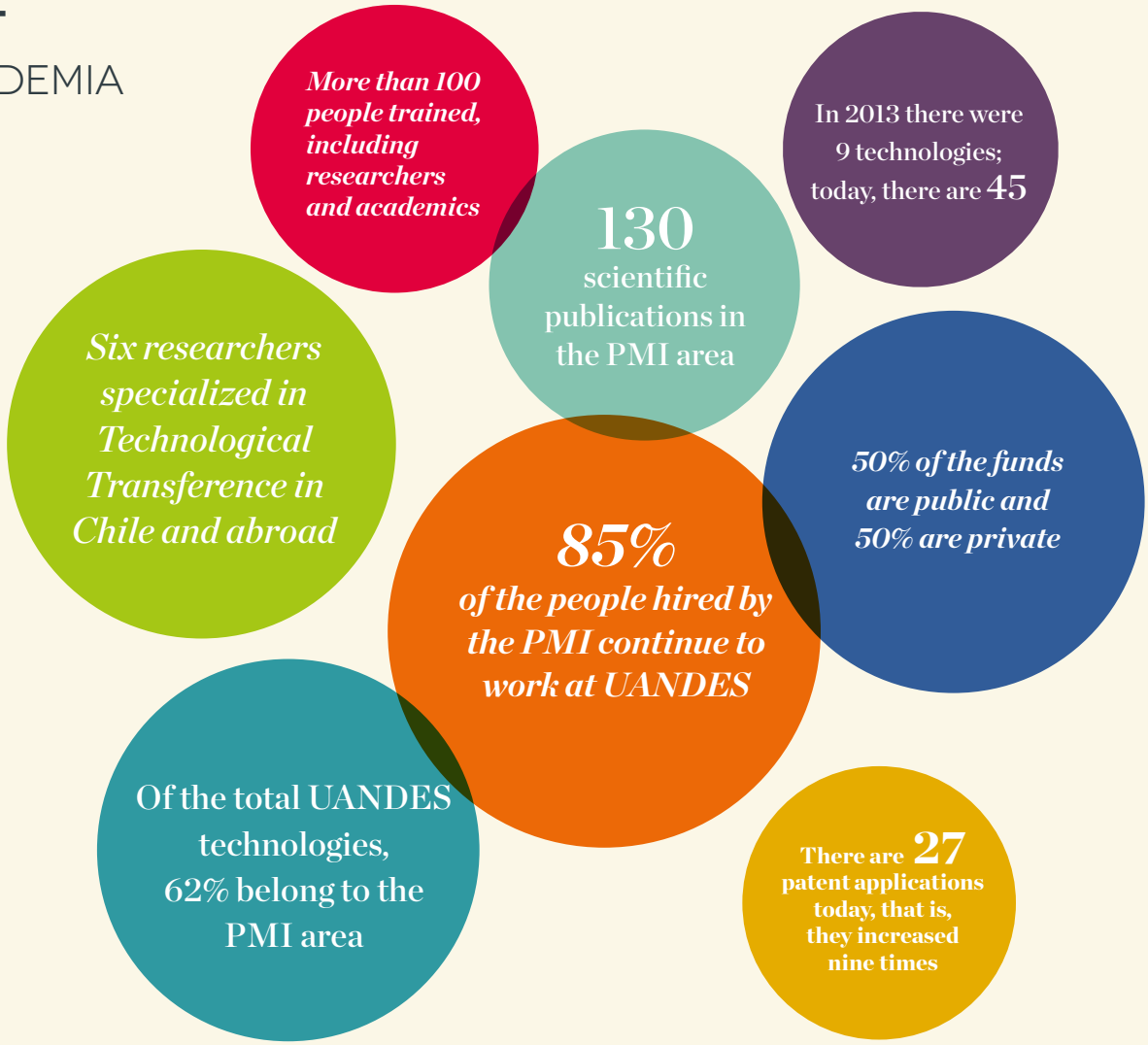
INTERDISCIPLINARY PROJECTS

	Q1+Q2 IMPACT FACTOR
2013	3
2014	5
2015	8
2016	11
2017	12

PMI FINANCED R+D+i PROJECTS

	Q1+Q2 IMPACT FACTOR
CONCEPT TEST	21
PROTOTYPE	1
PRE-CLINICAL	1
ESCALATION	1
BUNDLING	1
TOTAL	**25**

IMPACT
IN ACADEMIA



280

UANDES Professionals trained in innovation.

6

UANDES professionals trained in technological transference in USA.

1

Masters in Research and Innovation in Dentistry Sciences. First place nation-wide in science-based innovation.

350

UANDES students educated in R+D+i.

"Especially in technology, we need
revolutionary change,
not incremental change".

Larry Page,
Co-founder and CEO of Google.

02

Technologies

INTERDISCIPLINARITY
AS A STRATEGY

When determined that the University would begin to perform applied science, the great challenge was to link and articulate the work of the researchers in such a way that the walls of the laboratories constituted only physical barriers, and that interdisciplinarity was considered the center of the growth strategy. In this way, work began on what today are a total of 45 UANDES technologies.

The main asset that UANDES has in terms of research are its own long-time researchers and young doctors and professionals, who dared to experience the challenge of science-based innovation, looking for solutions from different disciplines and understanding that the team's greatest contribution is to articulate each member's technical knowledge.

The operation of the Department focused on this and executed four internal contests that positively evaluated initiatives presented by multidisciplinary teams. In addition, through regular meetings, the research results were shared with all researchers and contributions were received for their development in all areas, from laboratory techniques to business models.

Through these investigations, knowledge was generated, concept tests were carried out, prototypes and product scaling, thus enhancing the research from the idea to the market.

Today, the challenges are greater: continuing with the interdisciplinary research and attracting resources from other public and private sources to continue to enhance the results.

BIOFLOSS: DENTAL FLOSS WITH COPPER NANOPARTICLES

As a way to help improve people's oral health, Canadian-Lebanese dentist Ziyad Haidar, Ph.D., researcher at the Faculty of Dentistry and Medicine, developed Biofloss, a dental floss created from copper nanoparticles.

The importance of this technology, in addition to the value of using our country's main raw material, is that it could prevent diseases that together affect about 90% of the world population, such as periodontitis and caries, among others.

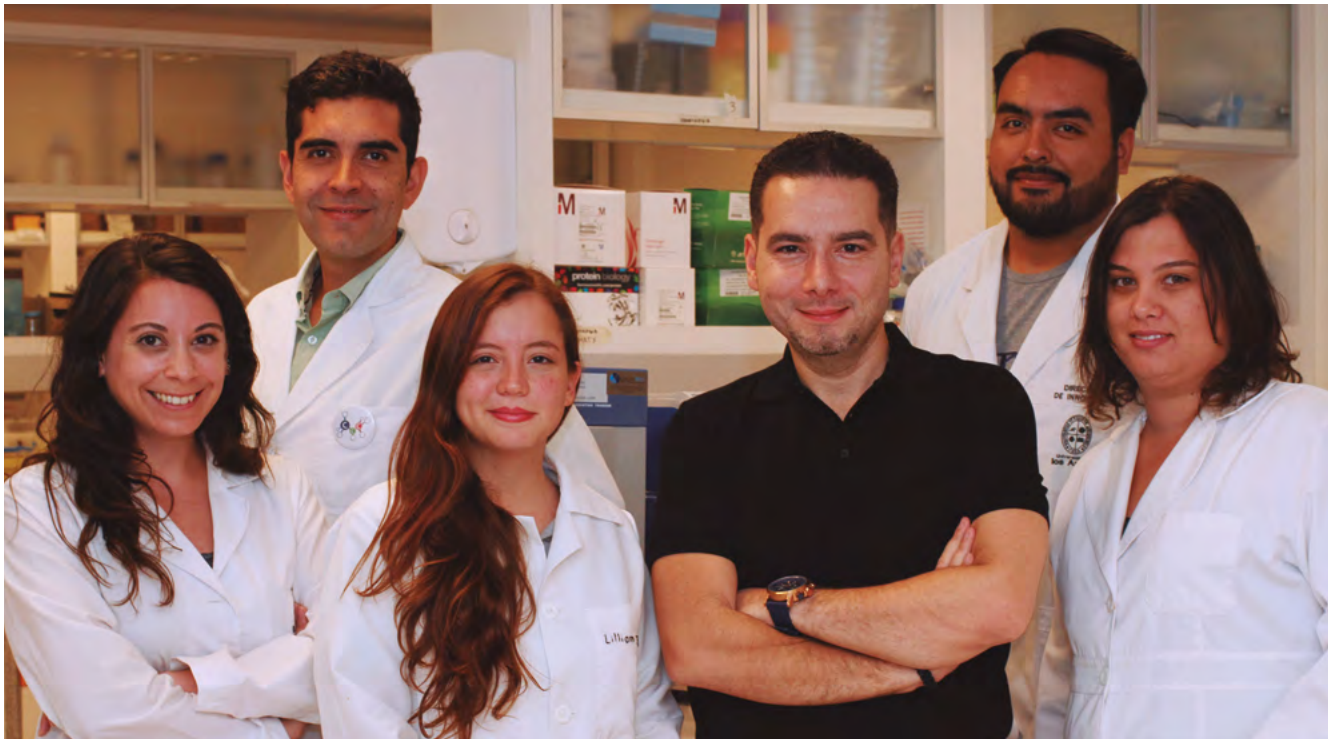
The idea, explains Dr. Haidar, is to improve the efficiency of dental floss with this coating; a dental, mucoadhesive, biodegradable nano-formulation that dissolves in the mouth and is specially designed for localized and controlled release of antibacterials and immunomodulatory agents in the interproximal and subgingival areas.

The accumulation of dental plaque as a result of poor hygiene, and the effect of microbial communities and their metabolism on the dentin and support tissues of the piece, are the main cause of the most common oral diseases, such as gingivitis, periodontitis and tooth decay, which have a near 100% prevalence rate, in different degrees within the population, and a high incidence in both men and women around the world.

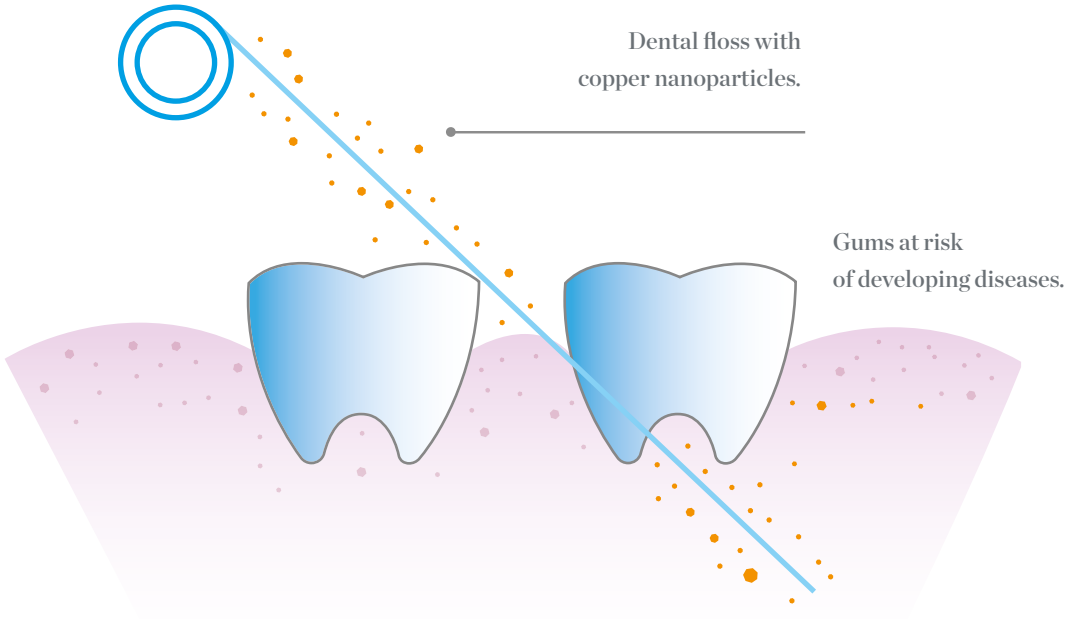
"When these diseases are prevented or treated in time they do not represent an important problem for oral health, however, when they progress to more advanced stages, they can cause irreparable damage to the tooth structure or to its supporting tissues, causing the loss of dental pieces or the need to perform the extraction, which is a routine practice for dentists", says the researcher.

For the development of this technology –he explains– public-private resources have been used, such as PMI (Institutional Improvement Plan of the Ministry of Education) and CORFO. An intellectual property strategy was also created, which resulted in a patent.

Currently, Biofloss is in the prototype stage and its action has permitted the control of the proliferation of common microorganisms in bacterial plaque, and it is expected, in 2020, to have validated results in an animal model.



BioMAT'X Lab team.



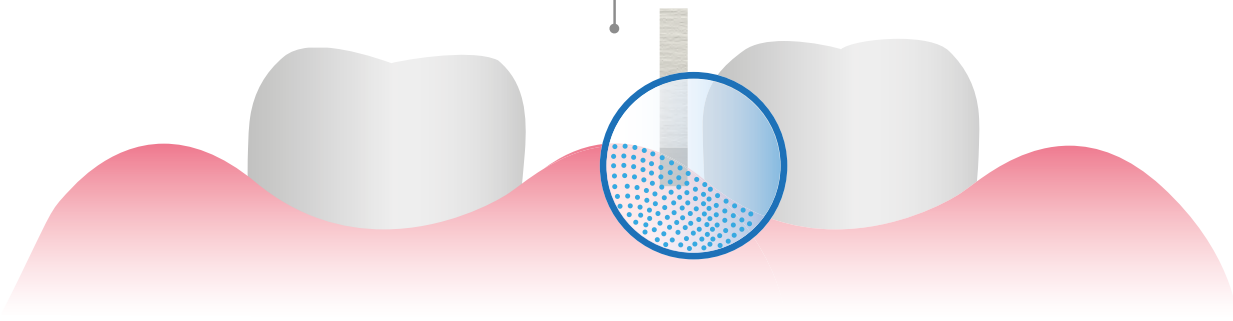
BIOMARKERS TO DETECT **PREGNANCY DISEASES**

The consequences of developing a disease during pregnancy not only involves risks for the mother and the newborn, but can also lead to sequels after gestation.

With the goal of preventing the development of different perinatal pathologies early on, and diminishing the associated risks, the Faculty of Medicine researcher, gynecologist, and expert in perinatal diseases, Sebastian Illanes, and the Faculty of Dentistry researcher and periodontics expert Alejandra Chaparro, have developed a tool to detect different placenta biomarkers present in the oral cavity.

Pregnóstica Team

Placenta molecules have been found In the saliva and gum fluid of pregnant women.



The objective of this procedure is to diagnose those diseases that put the life of the mother and the fetus at risk, such as premature birth, gestational diabetes or preeclampsia.

In a seven-year joint investigation, financed through UANDES resources, CORFO, FONDEF and PMI, the researchers verified that a correlation existed between patients who had specific pathologies in the gums and who developed a perinatal disease during pregnancy. Under this premise, both began to study if there was any molecule, present in oral fluids, which would determine the risk of developing these diseases.

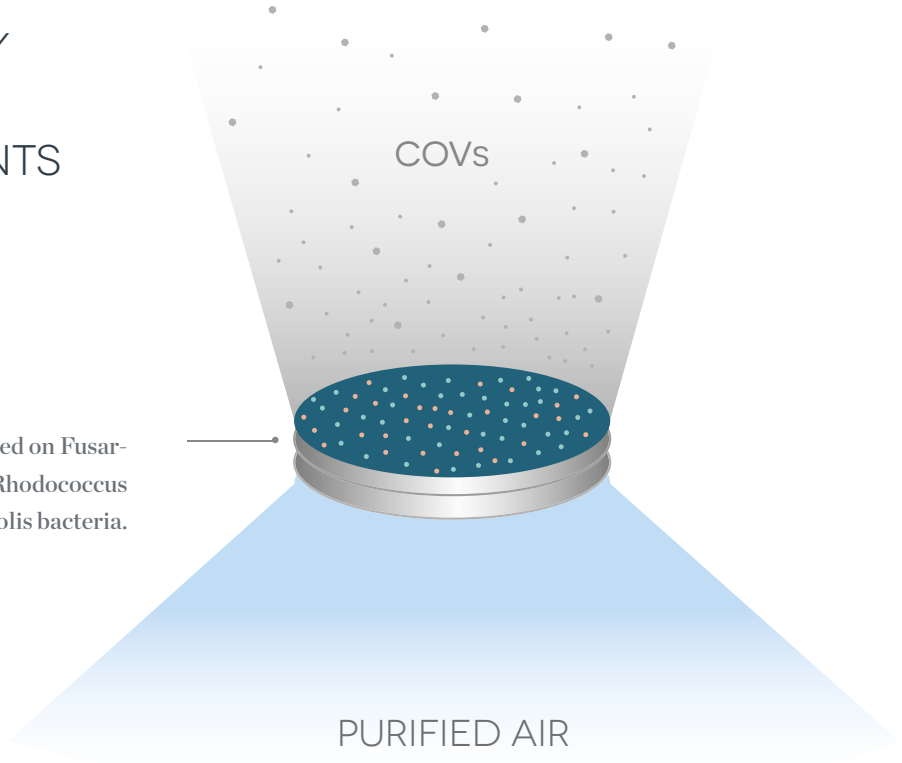
In the saliva and gum fluid of pregnant women, placenta molecules which are constantly released and that would be concentrated in the oral cavity (even at higher levels than in blood plasma) have been found. This has allowed researchers to study different molecules that act as biomarkers and help understand how the placenta is working.

Usually the diagnosis of these pathologies is made during the second or third trimester of pregnancy, when the symptoms have already presented themselves and the fetus is already subjected to adverse conditions for its development. Doctors Illanes and Chaparro developed a technology that allows diagnosing these diseases during the first trimester of pregnancy, which makes the prescription of preventive treatments possible.

To validate and scale the results of these investigations, in 2018, Pregnóstica was created, the fourth spin-off of the University.

This technology allows diagnosing these diseases during the first trimester of pregnancy.

AIR BIOPURIFIER: SEARCHING FOR A WAY TO DECONTAMINATE INTERIOR ENVIRONMENTS



Filtration system based on Fusarium solani fungus + Rhodococcus erythropolis bacteria.

With the purpose of improving people's quality of life, the Universidad de Los Andes Faculty of Engineering and Applied Sciences laboratory, Green Technology Research Group (G-Tech), has been working on an innovative technology to decontaminate the air that is produced inside of closed spaces. The air bio-purifier is a project led by Professor Alberto Vergara Fernández, Ph.D, that consists in the development of a biological indoor air purification system, a filtration technology capable of efficiently eliminating volatile organic compounds (VOCs) in a complex mixture of gases, for example, those generated by the combustion of firewood and/or industrial activity, transferring VOCs to an aqueous/biofilm phase, through the use of a biological treatment system which considers a consortium of microorganisms.

The biopurifier biodegrades contaminants thanks to the presence of a fungus called Fusarium solani and a bacteria, Rhodococcus erythropolis, also used in the bioremediation of soils. As if they were a society, the two microorganisms are placed on the solid support of the equipment, where they use pollutants as a source of carbon and energy for their growth.

Dr. Vergara explained that the poor air quality present in interiors and exteriors is a global problem with huge health consequences and different economic effects on society. "90% of the population of Chile lives in contaminated urban areas, being the contamination by polycyclic aromatic hydrocarbons (PAH) the most common. Currently, there are different technologies for the removal of particles, but they

Alberto Vergara, Academic Vice-Dean and Researcher of the Faculty of Engineering and Applied Science.

are not satisfactory methods when it comes to the control and elimination of volatile organic compounds (VOCs). Current biological purifiers have shown potential in interior air cleaning, but they are limited by their low treatment capacity", says the researcher.

In 2018, the academic, who has been studying for over 10 years the use of fungi for the elimination of bad odors and demonstrating the high degradation capacity they have compared to bacteria, together with his team, was awarded the second stage of CONICYT's FONDEF IDEA contest, to which only those have obtained the first stage funding can apply. Once successfully completing the first phase, of which they published three scientific articles and one patent application, the team composed by Dr. Alberto Vergara and the professors Felipe Scott, Ph.D.; Sichem Guerrero, Ph.D.; Patricio Moreno, Ph.D.; and Jessica San Martín, Ph.D., from UANDES; Germán Aroca, Ph.D. from PUCV; and Luis Díaz, Ph.D. from USACH, decided to apply for the second stage of IDeA and to include two national companies. These are Tecsinox, dedicated to engineering, design and construction of stainless-steel equipment, such as reactors, tanks and process lines in general, and Moninox Ltda., oriented towards the assembly of steel equipment and production lines.

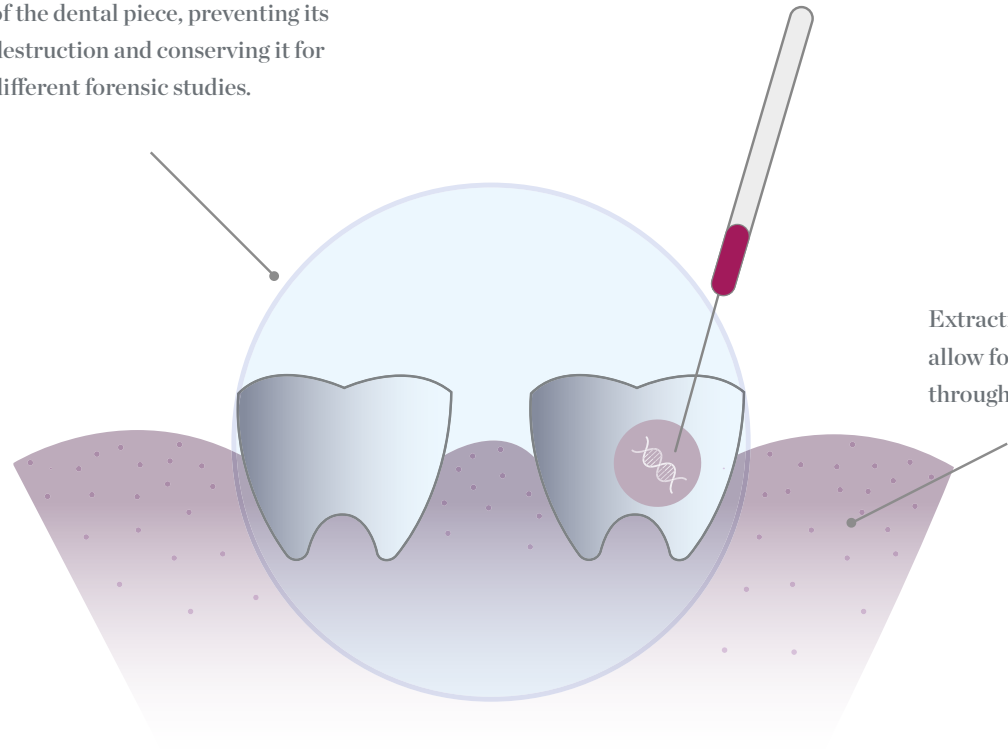
The ultimate goal is to scale up the technology at the pilot level, test the biopurifier under real conditions and propose a business model that allows marketing in 2020.

DENTAL FORENSIC KIT: TECHNOLOGY IN SERVICE OF FORENSIC MEDICINE

The Dental Forensic Kit (DFK) is a technology developed by the forensic dentist and researcher of the Faculty of Dentistry Patricio Carrasco, together with biochemist Carolina Inostroza, Ph.D. It consists in a DNA extraction method from human dental tissues without destroying the dental piece, which can be genetically analyzed for human identification, estimation of death data and even for toxicology tests.

Biology and Oral Regeneration Research Center (Cibro) team, of the of the Faculty of Dentistry.

The method permits the protection of the dental piece, preventing its destruction and conserving it for different forensic studies.



Extraction of tissues that allow forensic identification through DNA.

This technology was developed in the Faculty of Dentistry's Biology and Oral Regeneration Research Center (Cibro), which has spent eight years dedicated to research in forensic science. It has worked with UANDES and PMI resources, which means that it is a prototype validated in real functioning and operation conditions. The Innovation Department developed an intellectual property strategy, which resulted in a patent of this invention.

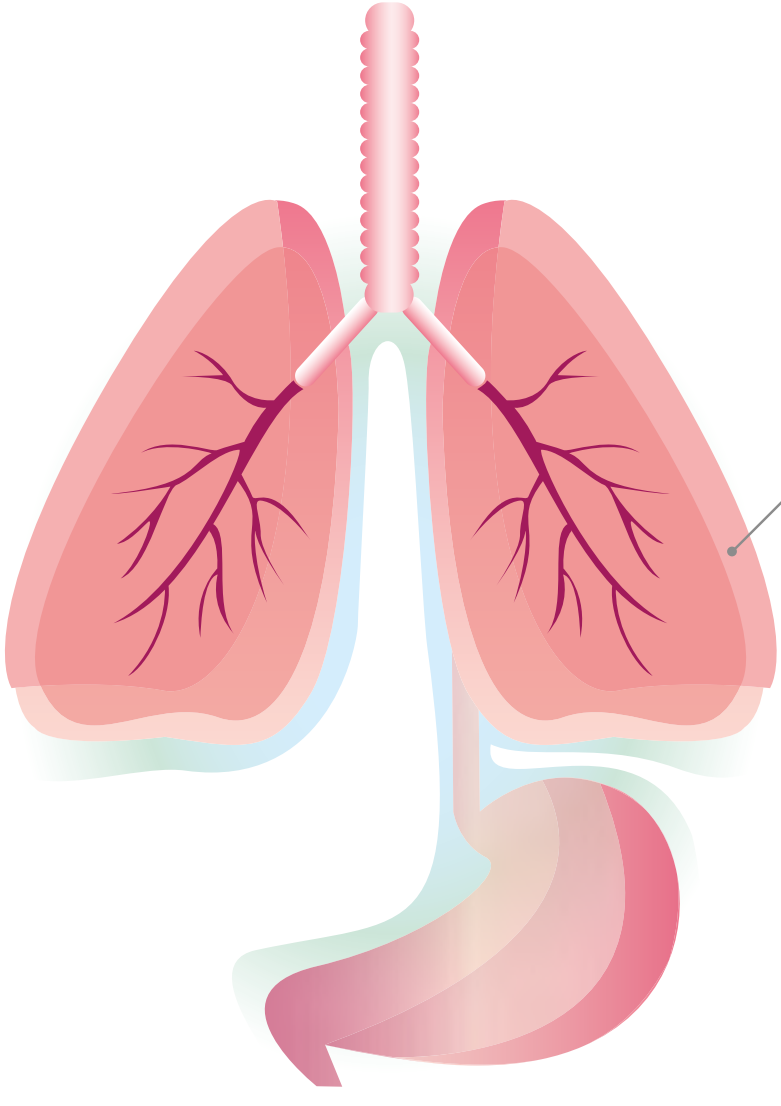
Currently, the technique used for DNA extraction for forensic identification consists in spraying the bone, which implies the destruction of the bone piece and that it takes between 48 and 120 hours; whereas DFK proposes a procedure that takes between eight and 20 hours, which implies an 83% decrease in time.

The kit was tested by Medical Legal Service (SML) forensic experts of Concepción. Also, samples elaborated in Chile and sent to the United States were analyzed successfully in conjunction with the company Verogen, validating that the kit is capable of coupling with state-of-the-art gene analysis and forensic identification technologies. This work also caught the attention of Carabineros (Chilean police service) Department of Criminalistics (Labocar) thanks to its innovative technique for extraction of human dental tissues without destroying the tooth, along with its easy use and implementation, speed and simplicity compared to the standard methodology, thus an agreement was arranged to test the DFK technology in real conditions.

Patricio Carrasco stated that "this technology will be very useful for The Police, since it will allow them to carry out their work without losing important pieces, which could be useful for future or deeper exams, that cannot currently be carried out due to the loss of the tooth at the moment of its examination."

Along with this, the French Gendarmerie has manifested an interest in this kit and has an alliance with the SML so that they may apply this technique in complex identification cases. With it, it is possible to know an estimate of the data, cause of death and the presence of toxins in the person.

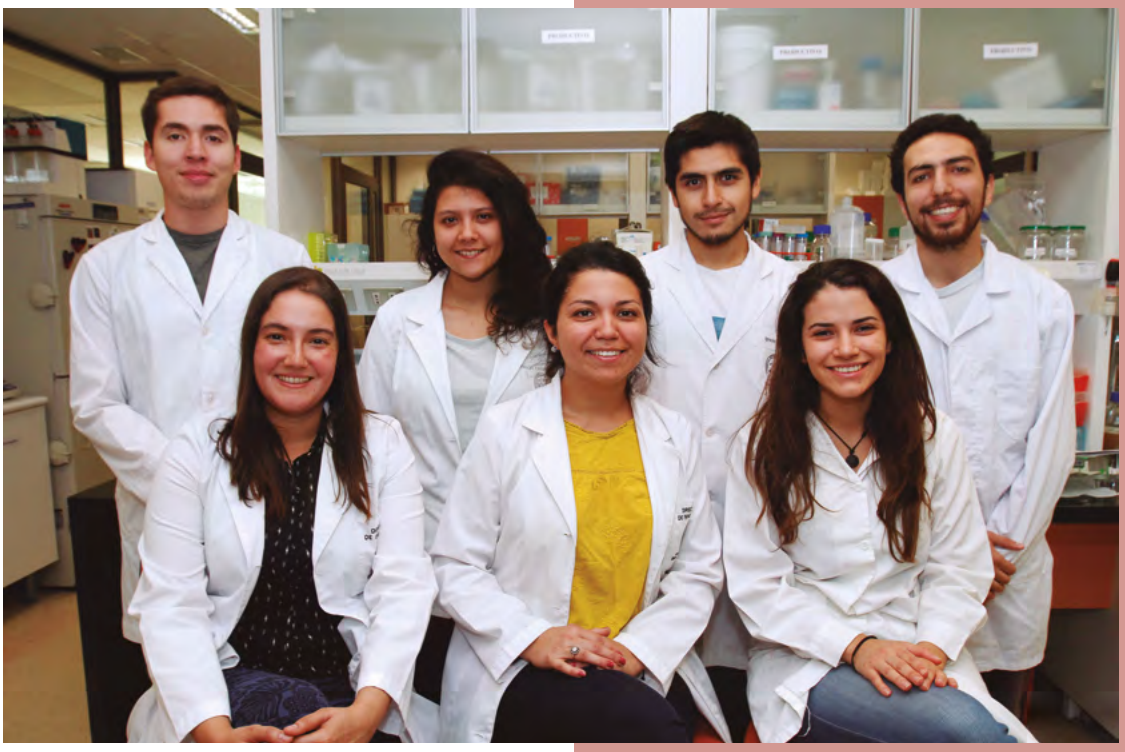
PRODUCTION OF **REGULATOR T CELLS**



Human regulatory T cells (hTregs), have the therapeutic potential of avoiding rejection in organ transplants.

Karina Pino, Ph.D., is a researcher at the Cellular and Molecular Immunology Laboratory, oriented towards the investigation of biological mechanisms that allow us to understand how the immune system acts in different diseases.
One of the objectives of this technology is that the generated knowledge contributes to the design of treatment therapies for immune system diseases. In particular, there has been a focuse on studying the interaction of this system with the mesenchymal cells.
Dr. Pino and her team have worked in the standardization and improvement of the protocol for the production of human regulatory T cells (hTregs), which have the therapeutic potential of avoiding rejection in organ transplants, thus solving a problem many patients face.
The results of this investigation were made known through an indexed publication.

In 2017 alone, 135,860 organs were transplanted in the world, which meant an increase of



Cellular and Molecular Immunology Laboratory team.

7.25% with respect to 2016, according to the World Health Organization (WHO). Of these, 89,823 transplants were of the kidney (40.2% from live donors), 30,352 of the liver (19.8% from live donors), 7,626 heart, 5,497 lung, 2,342 of pancreas and 220 of intestine.

Meanwhile in Chile, the lowest number of transplants within the last 10 years was registered during 2018, reaching only 81 donors, contrasting with the 173 that set the record in 2017, according to figures from the Ministry of Health.

This growing demand has led to the global market of immunosuppressive drugs for transplantation to be estimated in US $ 3.4 billion for the year 2023.

Another potential application of the research focuses on the role of hTregs cells in tumor growth. Through the study of this cell group, it is intended to develop new oncological therapies that can treat aggressive resistant types of cancer. At the same time, the global market of immunotherapies is projected to reach US $ 201.5 billion in 2021, with a significant growth rate of 13.5% per year.

In Chile, the lowest number of transplants within the last 10 years was registered during 2018, reaching only 81 donors, contrasting with the 173 that set the record in 2017, according to figures from the Ministry of Health.

REGENERATION OF DENTAL PULP: TECHNOLOGY TO RECOVER THE VITALITY OF THE TEETH

The Universidad de los Andes Faculty of Dentistry has encouraged the development of technologies that allow the regeneration of soft and hard tissues in the oral cavity. In this way, interdisciplinary research groups have been formed to develop cell therapies and devices to improve recovery strategies, for the benefit of patients.

In order to maintain teeth vitality, Claudia Brizuela, Ph.D, dentist and researcher of the Faculty of Dentistry, and Maroun Khoury, Ph.D., Scientific Director of Cells for Cells and researcher of the Faculty of Medicine, in conjunction with their teams, developed Cellistem ER.

This product, unique in the world, is a biological filling that consists of a biological matrix and mesenchymal stem cells, which allows the regeneration of the dental pulp, recovering nutrition and immune defense against new infections. Furthermore, it maintains the tooth's structural integrity, improving its biomechanical behavior. All of this signifies an important improvement compared to conventional root canal treatment, which consists of an inert filler that does not permit the restitution of immune function or pulpal sensitivity and can weaken the tooth.

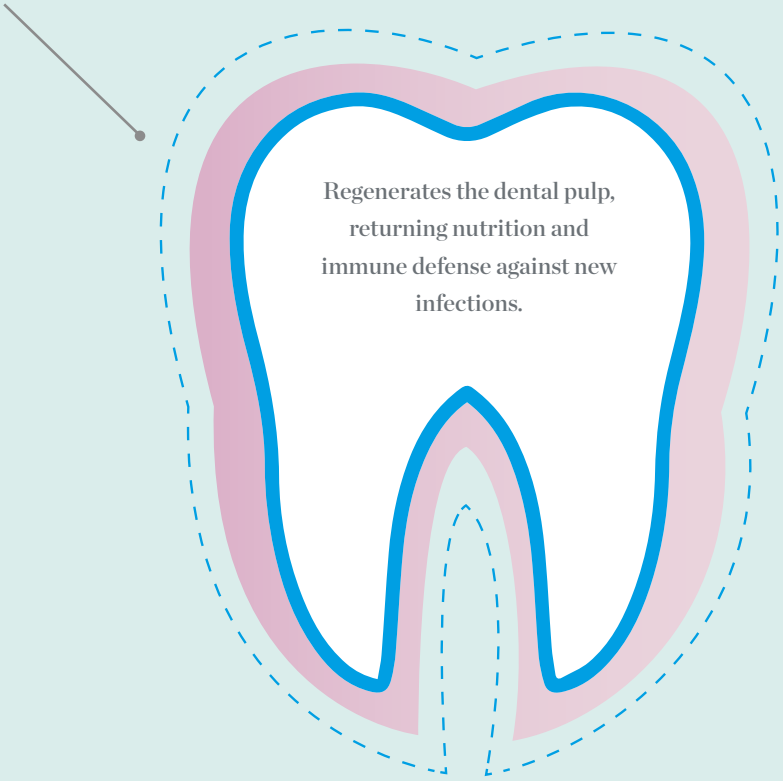
The clinical test of Cellistem ER considered the application of the therapy to 20 patients, at the Universidad de Los Andes Health Center in San Bernardo and the UANDES Clinic, and proved, in addition to its safety, to be a highly effective treatment in maintenance of tooth vitality, after one year of post-intervention follow-up.

This investigation completed its clinical trial phase (phase I/II) at the end of 2018 (ClinicalTrials.gov Identifier: NCT03102879) and was funded through of CORFO.

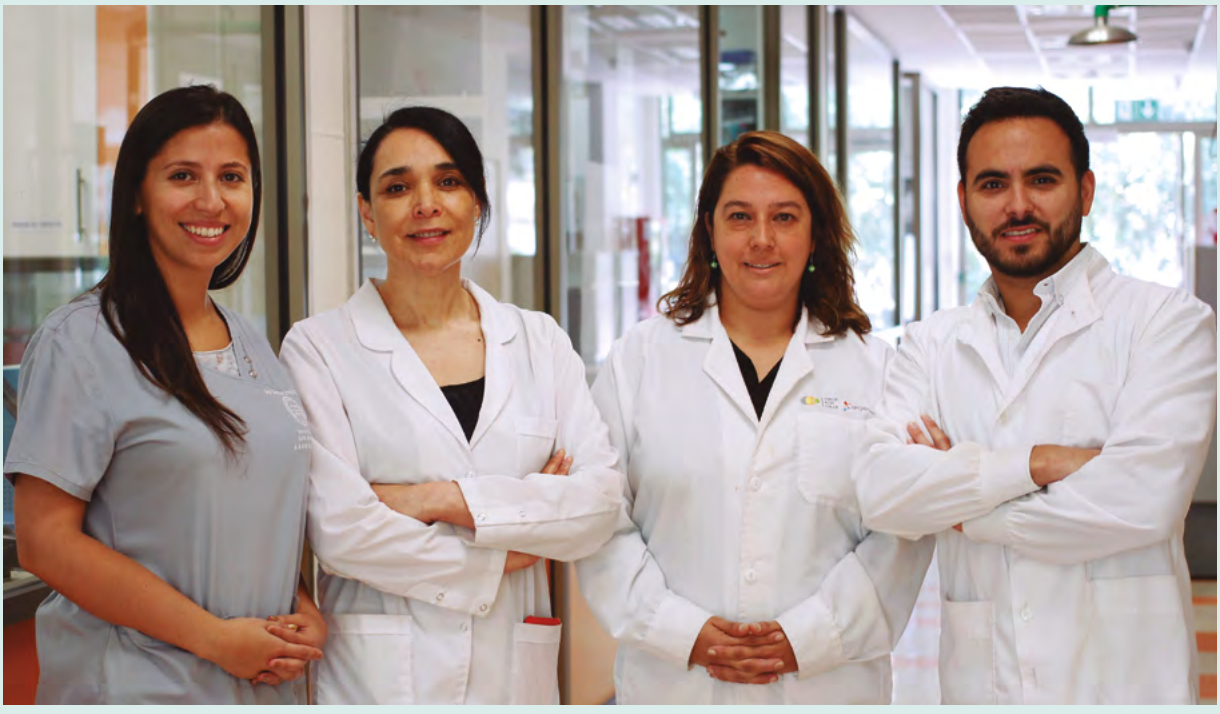
Currently, the technology has a patent, under PCT agreement, code WO 2018 131003 A1, and is validated in a relevant environment, that corresponds to a Technology Readiness Level (TRL) 6.

The product was presented to leading doctors in the field of endodontics and is already available for application in the Universidad de Los Andes Clinic and for acquisition by professionals.

The product is a biological filler which consists of a biological matrix and stem cells.



The technology manages to maintain structural integrity of the tooth, improving its biomechanical behavior.



Dra. Brizuela´s team.

TECHNOLOGIES

DIALECT: IMPROVING CHILDREN'S READING SKILLS

In 2012, Universidad de Los Andes Faculty of Education Researchers, developed the Dialect platform in conjunction with Colegium and with the support of CORFO.

Researchers from the Faculty of Education: Marianela Navarro, Carolina Melo, Pelusa Orellana, Kattia Muñoz and María Francisca Valenzuela.

Several studies show that the reading ability of the Chilean population has not changed since 1998, concluding that 44% of the adult population in our country find themselves in a situation of functional illiteracy in texts. The same can be observed from the results of the PISA (OECD) and SIMCE (MINEDUC) tests, where despite some progress in the evaluation levels, the OECD average or "elementary level" of reading comprehension has not been reached.

At the same time, the SIMCE results show that of the three levels of performance in reading (insufficient, elementary and adequate), 60% of Chilean students do not exceed the elementary level in fourth grade, since 2012.

In response to this need, the Faculty of Education researchers at Universidad de los Andes, and Ph. D., Pelusa Orellana and Carolina Melo, developed the Dialect platform (Diagnosis of Early Reading Skills) for children between kindergarten and fourth grade, in conjunction with Colegium and with the support of CORFO.

However, the desire of the two educators was to be able to cover all school education, so they decided to expand the range of study. Thus, in 2018 they applied for a Contract Research for the preparation of the Dialect test from fourth to fifth grade. The platform for the higher grades consists of a silent reading comprehension test, which delivers a Lexile® measure for each student, a scale developed by the American company MetaMetrics, and which determines the person's reading comprehension capacity and the level of complexity of a text.

The advantage that this indicator provides is that the teacher, knowing the metrics of each student, can make adjustments between the child's reading ability and the book that is assigned independently, together with a strategy to improve their skills. This guarantees that the comprehension of the child will be at least 75% successful.

"The middle school test has already been applied in some sophomore students, at the request of the Quality of Education Agency and also as a diagnosis for admission to Educational Studies in some universities. In March 2019, piloting for the second elementary cycle will begin", explained Pelusa Orellana, who is also Vice-Dean of Research of the UANDES Faculty of Education.

Currently, Dialect has been applied in 12,000 students of Chile and Argentina, and in the coming months it will begin testing in Costa Rica.

By the end of 2020, the platform must be fully developed for all school education.

DIAMAT, A PLATFORM TO ASSESS CHILDREN'S MATHEMATICAL ABILITIES

Researchers from Diamat: Isabel Torres, Micaela Buraschi, Kattia Muñoz and Marianela Navarro.

Motivated by Dialect's experience, researchers from the Faculty of Education Kattia Muñoz and Macarena Larraín developed Diamat, a platform to evaluate the math skills of children in the different core areas of the curriculum.

Diamat follows the same logic as the Dialect test of reading comprehension; that is, through an individual test applied to each child, a Quantile® is determined, a scale developed by MetaMetrics, the same company who developed the Lexile® scale for Dialect.

This test additionally generates a real time report, with an analysis of the student's performance and general suggestions of the areas to strengthen. In this way, the teacher can access the necessary information to formulate an action plan or a specific intervention to address those areas that require greater support according to each individual's needs.

In order to elaborate this platform, which is financed through CORFO and with the support of Colegium, UANDES educators did an exhaustive job to cover the contents that are taught in different countries within the continent. The objective was to study the mathematics curriculum throughout Latin America, looking for common points and thus being able to develop a test that could be applied to any child in the region.

One of Diamat's advantages is the response analysis system that allows the teacher to know each student's most common mistakes in mathematics, identifying the comprehension problems that the child presents and how they can be approached. And, like Dialect, at the end of the test, it delivers pedagogical suggestions for the teacher and the student.

Hand in hand with Colegium, the test has been successfully implemented in different schools in the Metropolitan Region, in children between kindergarten and fourth grade. This company has been a key partner in the development of this platform, since they have digitized and improved access to the tests and have made their networks available in the Chilean and Latin American educational system.

The next step for this research is to obtain resources to develop the test in the other levels of school education. Since its creation, more than 6,000 students have been evaluated with Diamat, in 22 schools in Chile and Latin America.

One of Diamat's advantages is the response analysis system that allows the teacher to know each student's most common mistakes in mathematics.

LEER+ BETTER VOCABULARY, GREATER READING COMPREHENSION

After noting the reading comprehension difficulties of many students, the UANDES Vice-Dean of Education, Pelusa Orellana, Ph.D., developed Leer+.

The central objective of this platform is to give teachers the necessary tools so that they can exercise reading comprehension and vocabulary, differentiating the learning and progress of the students.

This instrument works by having the child read a short text and define, based on context, which are the correct words for the sentence to make sense, thus working simultaneously on comprehension and vocabulary.

To build this tool a linguistic corpus was created, which makes it possible to know the vocabulary level of each child. That is, a set of words ordered by frequency of use, that serves to determine the difficulty of words.

The corpus is unique in Chile, because it brings together all the words that a child uses from kindergarten to middle school. For this, the researchers grouped together the textbooks handed out by the Ministry of Education, the list of recommended complementary reading books and, the books that kindergarten teachers read to children. In addition to the above, the writings were digitized, and a database ordered by difficulty of each word was built. This database was created by Jeff Elmore, MetaMetrics researcher, company who has also collaborated in the development of the projects Dialect and Diamat. The participation of this company allows the use of the Lexile® measurement as a complexity metric of the text and reading ability of the students.

To develop the first prototype of this platform, Pelusa Orellana was awarded a FONDEF in 2017. With these funds, she worked on a software that includes 500 reading texts, of reading comprehension and vocabulary, which will be

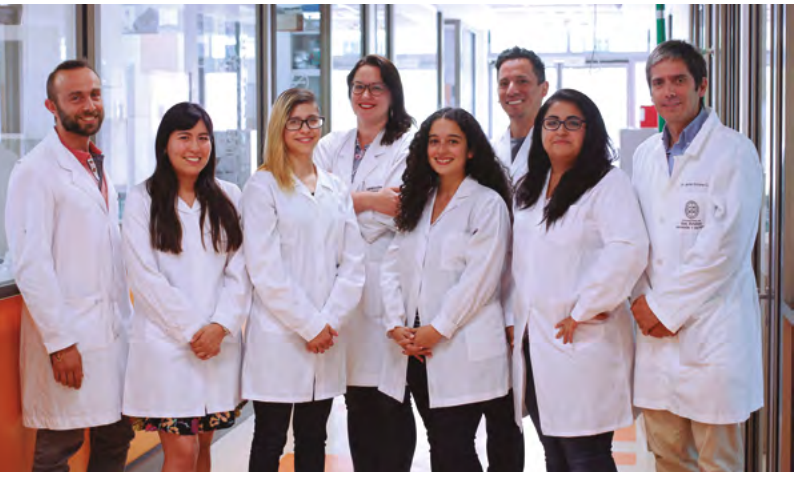
arranged according to progressive difficulty using the Lexile® framework.

In a first stage, Leer + will be developed for children between third and sixth grade. “We chose those grades because between those ages there is already a more independent, comprehension and vocabulary focused reading level, two subprocesses closely linked to each other, where children with better vocabulary have greater understanding and vice versa”, explained Pelusa Orellana.

The platform was piloted between the end of 2018 and early 2019 in 600 students, from different schools and regions of Chile, and it is expected to be operative during the second quarter of 2019, when the first impact study can be carried out, where student’s reading skills will be measured before using the platform, then Leer+ will work with them for a semester, and finally return to evaluate and analyze their evolution.

“We chose those grades because between those ages there is already a more independent, comprehension and vocabulary focused reading level, two subprocesses closely linked to each other, where children with better vocabulary have greater understanding and vice versa”, explained Pelusa Orellana.

COATING, AN EDIBLE COVER TO PROLONG FRESH FOOD SHELF LIFE

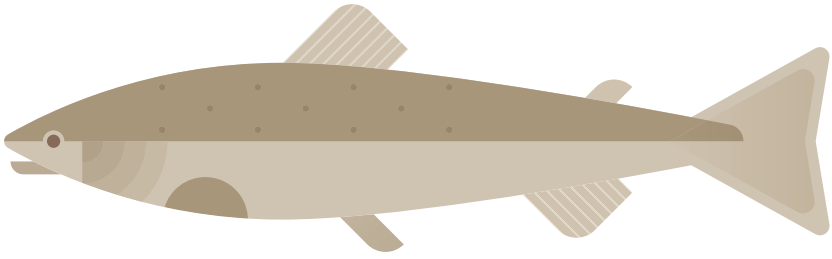


Biopolymer Research and Engineering (Bioprel) Lab team.

More than 30 years ago, the salmon industry was fixed as a catalyst for the national economy, turning Chile into the second exporting country of this product worldwide, only surpassed by Norway. In its development, there was always a desire to evolve from the production of commodities towards highly technological products with added value. In the UANDES, hopes were placed on the use of salmon beyond solely exporting a protein for human consumption.

Javier Enrione, food engineer, Ph.D. in Food Sciences and director of the Biopolymer Research and Engineering Lab (Bioprel), developed, together with Paulo Díaz, Ph.D., an edible coverage based on gelatin from modified salmon to extend the shelf life of different types of fresh foods, those that present a series of technological challenges and logistical issues related to transport timeframes and waste valorization.

The technology has a low production cost for the food industry, is easy to apply, and allows the extension of food shelf life in up to 30%, which translates into a decrease in losses of fresh products. Until now, the researchers of the Faculty of



The developed technology makes it possible to extend the shelf life of foods like fresh meat, fruits and vegetables in up to 30%.

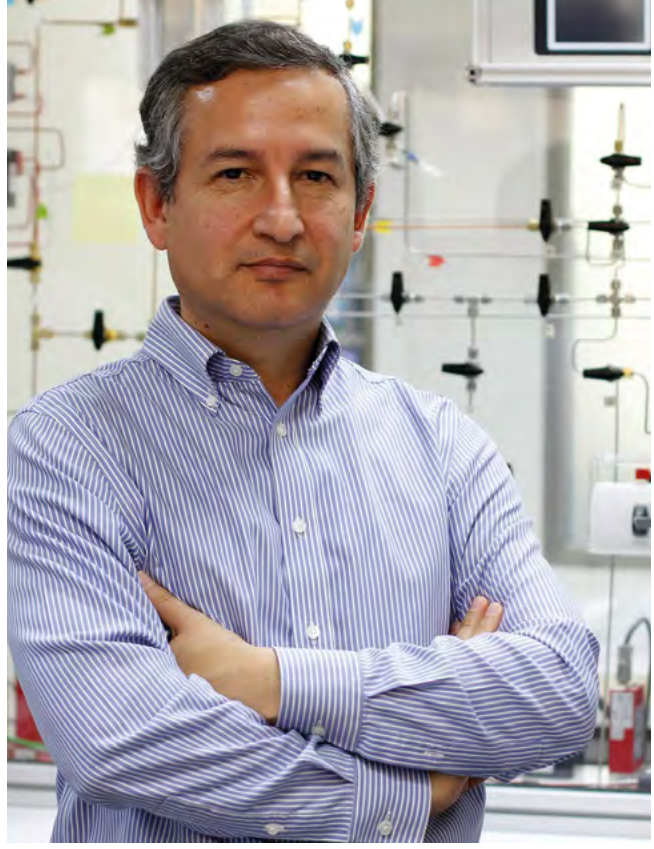
Medicine have aimed at positioning the gelatin or coating in the exporter industry of fresh salmon to give it additional value and differentiate it from other producing countries.

But the ultimate goal of the coating is to be able to apply it in other food industry products, such as fresh meat, vegetables and fruits, and thus give the national sector a comparative advantage that would make it more competitive worldwide, since the food would retain all its properties and freshness without altering the flavor. It is worth mentioning that the food sector is Chile's second highest export market, after the mining industry, and that the products that lead the shipments are salmon, trout, grapes, apples and cherries.

Currently, the coating is being tested under real conditions in salmon farms in Puerto Montt, and although it works with funding from CORFO and FONDEF, it still requires greater capital to be transferred to the market. Additionally, an intellectual property strategy was developed to protect the development, through the respective patent. Until now, Enrione and Díaz have published seven ISI articles on this subject.

The technology has a low production cost for the food industry, is easy to apply, and allows the extension of food shelf life in up to 30%.

ENGINEERING AT SERVICE OF SOCIETY



Sichem Guerrero, researcher at the Faculty of Engineering and Applied Sciences and member of the Green Technology Research Group (GTech).

CATALYTIC CONVERTER FOR STOVES: A SOLUTION TO THE POLLUTION PROBLEM

In Chile, 74% of households between the regions of O'Higgins and Aysén use wood as fuel for heating and cooking (according to Casen's 2013 study). The problem is that, in addition to its widespread use, the low efficiency of the heaters and the poor quality of this resource have largely affected the increase in pollutant emissions, becoming one of the main sources of air pollution by particulate material (PM) in our country, with especially notorious accumulation in urban centers.

For two years, the researcher from the Faculty of Engineering and Applied Sciences and member of Green Technology Research Group (GTech), Sichem Guerrero, Ph.D., has worked on the development of a catalytic converter for wood stoves, low-cost and copper-based, which allows an effective reduction in carbon monoxide emissions.

Professor Guerrero's work has been focused, on one part, on investigating the chemical formulation of the catalyst, so as to optimize the conversion of pollutants and, on the other, on building and validating a catalytic converter prototype for the removal of gaseous pollutants and particulate material from the burning of firewood. The technology, which obtained state financing of the FONDEF IDeA contest (FONDEF Id16I10358), has been encouraged by the company Bosca, where the support that houses the catalyst, and that makes it possible to take measurements within an operating stove, was built and implemented.

According to Professor Guerrero, preliminary tests have demonstrated that these copper-based catalysts have a high effectiveness in the elimination of monoxide and especially highlighted the opportunity to work with Bosca in the development of this project. "It is important to establish a bridge of collaboration between applied research from Universidad de los Andes and private companies, to reach innovative solutions with potential for mass production", he said.

Even when there are efforts to carry out plans for decontamination in different areas of Chile, the background problem persists, due to the existence of deficient technologies for combustion of firewood and the lack of regulation, for example, in the sale of non-certified firewood or exploitation of native forest.

Considering that the use of firewood makes up 20% of the total primary energy consumption in Chile (oil, coal and natural gas), there is no doubt that strict measures about emission ranges must be accompanied by technologies that make it possible to reach low levels of pollutant emissions.

In that sense, the technology developed by professor Guerrero with Bosca's support becomes relevant, because it delivers a solution to a real human problem. Hopefully, this catalyst will soon be available on the market.

RESEARCHERS FROM ANTARCTICA

Another investigation being conducted at the Faculty of Engineering and Applied Sciences has to do with the use of enzymes present in Antarctic microorganisms to enhance the food and biofuel industry.

This investigation, developed by the researcher Felipe Scott, Ph.D., in conjunction with Universidad de La Frontera Faculty of Medicine academic Leticia Barrientos, Ph.D., aims to characterize the activity of Antarctic-bacteria-originated enzymes that are active in the cold.

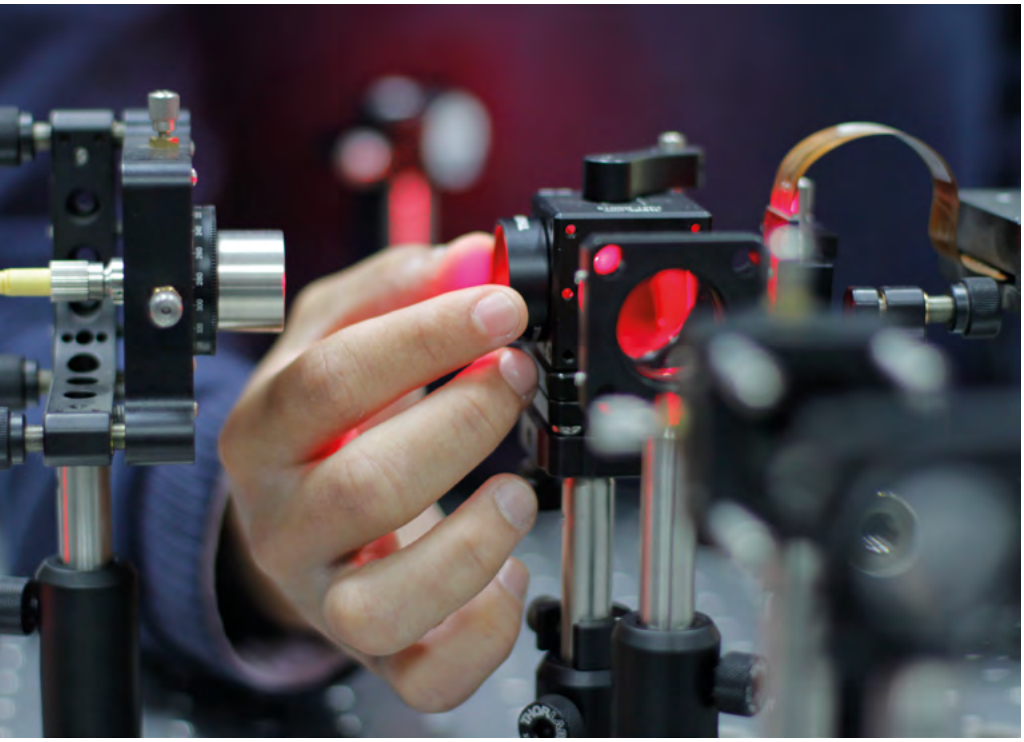
One of Dr. Scott's main motivations of for this project is to simplify, economize and make sustainable the productive processes of the food and juice industry, a consolidated area, and those of the budding biofuel industry. The investigation focused on the search for enzymes that can act at low temperatures in dairy industries, which would reduce the operation and investment costs and simplify current productive processes.

Each of the aforementioned industries have particular reasons for using psychrophilic enzymes versus those that act at room temperature or higher (60°C or more). For the food industry, those reasons include the reduction of operation costs, better maintenance of the product's sense-perceived properties (like flavor, texture, scent, color or temperature) and better microbiological control. Meanwhile, for biofuels, the use of these lower temperatures implies, in addition to a reduction in operation and investment costs, a simplification of the currently used processes. As for the juice industry, the use of these enzymes would mean an improvement in product quality and yields.

The project was funded by UFRO-UANDES iniciative, and the activities carried out included screening more than 300 bacteria from Antarctica. This selection allowed the identification of a bacterial strain with the ability to hydrolyze lactose at 4° C.

Preliminary results show that this enzyme can hydrolyze the lactose present in cow's milk, although more trials are needed to characterize its applicability in the industry.

Felipe Scott, researcher at the Faculty of Engineering and Applied Sciences.



Jaime Anguita, Dean of the Faculty of Engineering and Applied Sciences.

WIRELESS LASER COMMUNICATION: INCREASING CONNECTIVITY

The Universidad de los Andes Faculty of Engineering and Applied Sciences has taken a leading role in the development of technologies aimed at solving complex problems such as environmental pollution or increasing connectivity in areas of difficult access, two phenomena that particularly affect our country. The Dean of the Faculty, Jaime Anguita, Ph.D., through FONDEF, has been investigating new applications for wireless laser communication, with the objective of delivering digital broadband access to the extreme and isolated areas of Chile, as well as to industries that, due to the nature of their operations, work in complex environments, such as mining, construction and even defense institutions.

In 2017, the academic's research was awarded a CORFO fund to develop a high privacy prototype system of wireless point to point communication, based on laser modes, and that offers a communication rate of up to 50 megabits per second (Mb/s). Along with this, a system will be created for both transmission and reception of data.

The method developed by the dean consists in using compact and inexpensive optical transceivers, capable of functioning in different environments at distances of up to one kilometer.

This technology seeks to build a prototype that allows the increment of digital data connectivity, to interconnect separate networks or provide high privacy connections to difficult access areas, an issue that has become an important aspect of development and that, so far, has not been satisfied in Chile or in Latin America.

Rodrigo Astroza, researcher of the Faculty of Engineering and Applied Sciences

MONITORING WIND ENERGY

The professor of the Faculty of Engineering and Applied Sciences Rodrigo Astroza, Ph.D., developed a technology to monitor and anticipatedly predict possible structural damages in wind farms, specifically in the turbines.

To accomplish this, he designed software and hardware that allow remote monitoring of these structures, real time observation of current conditions, and a projection of the state of the turbine components, in addition to delivering proposals on corrective and preventive maintenance.

The method considers a diagnosis, evaluation and forecast, through a mathematical model, from the actual data obtained. Furthermore, it also considers a phenomenological prototype and a probabilistic pattern that includes uncertainty.

The technology is being developed with real data obtained from national companies and it is expected to have a prototype ready by the end of 2019.

Wind power is being driven by the increase in public policies that promote clean energy development in order to reduce environmental impact, a fact that can be widely observed in the increase of wind turbine facilities, especially in Pacific Asia, Europe and North America.

Since mid-2018, the country has more than 650 wind towers, which together generate 1,426 megawatts (MW) of energy, which represents 4.7% of 2017's gross generation in the National Electric System. And as for the power that renewable energy projects currently in construction will generate, reported until July of 2018, 63% will correspond to wind energy, which implies that this technology has a high potential for adoption market.

THE COUNTRY'S FIRST CELLULAR THERAPY CENTER IN THE **UANDES CLINIC**

In November 2018 the Cell Therapy Center of the Universidad de los Andes Clinic was inaugurated, a project developed together with Cells for Cells (C4C), the first UANDES spin-off dedicated to research, development and commercialization of innovative cellular therapies.

This center has duly certified specialist doctors, the most modern stem cell laboratory in Latin American, and the only clinically proven cell therapy for the treatment of knee arthrosis, Cellistem®OA, whose use has been extended to hip, ankle and hand pathologies.

"This is the result of several years of work and rigorous research in advanced therapies. We are proud of the work done with the clinic and its doctors, who have made it possible to conduct clinical studies that are a global contribution", stated Dr. Fernando Figueroa, Director of the Universidad de los Andes Cell Therapy Program, co-founder of Cells for Cells and rheumatologist of the Universidad de Los Andes Clinic.

"The basic research that emanates from Cells for Cells has positioned us at a significant place of leadership in Latin America, but the arrival of therapies for patients was still a pending debt, "he explained of this now fulfilled objective. "To date, there are two controlled clinical trials in international literature and patients who have benefited from this treatment, which is possible in few places in the world with these quality standards."

In the opinion of Dr. Thomas Vangsness, traumatologist and sports medicine and cell therapy specialist of the University of Southern California, invited to the inauguration of the center, arthrosis is a high prevalence disease, with more than 60 million patients only in the United States. "In the world there are many therapies applied for osteoarthritis that do not have clinical evidence and that are used indiscriminately in patients. What has been developed in Chile is a high standard cell therapy, based on clinical evidence, which can be applied to osteoarthritis patients lacking other therapeutic alternatives", assured the specialist.

The Cellistem®OA therapy has been successfully tested in more than 100 patients, managing to reduce the pain in 80% and substantially improving the joint function, compared to traditional therapy with hyaluronic acid. These results are supported by the first Latin American study of Phases I/II, performed entirely at Universidad de los Andes Clinic by the Traumatology and Rheumatology team.

For the General Director of the Clinic, Jorge Laso, the relevance of this initiative lies in that, with this center, more people will be able to access cellular therapy treatments with high standards of scientific rigor, technology and international quality.

Universidad de Los Andes Clinic

Center for Biomedical and Bioengineering Research and Innovation

CIIB, THE CENTER WHERE TECHNOLOGIES ARE BORN

This building houses, in the same physical space, academics, researchers and students, favoring knowledge transference and advanced human capital formation.

The Biomedical and Bioengineering Research and Innovation Center (CIIB) is a unit of the Universidad de los Andes that aims to integrate, coordinate and manage the research, innovation and postgraduate activities in Biomedical Sciences and the Faculty of Engineering and Applied Sciences.

Since its foundation, in 2012, the CIIB has been functionally linked to the faculties of Medicine and Dentistry, trying to promote research and biomedical innovation, promoting integration and synergy between different areas of knowledge, scientific disciplines and basic sciences, applied sciences and clinical sciences researchers.

In 2017, the building that houses the laboratories in the Engineering area was inaugurated.

2,400 SQUARE METER *constructed*

MORE THAN 100 *working professionals*

LABORATORIES

- **Neurosciences, Electrophysiology, Physiology, Reproduction, Immunology, BioPREL.**
- **CIBRO - BioMAT'X.**
- **C4C - Regenero.**
- **Pregnóstica**
- **Applied Chemistry Laboratory.**
- **Robotics Laboratory.**
- **Human Dynamics Laboratory.**
- **Bioprocesses Escalation Laboratory.**
- **Energy Conversion Laboratory.**
- **Instrumentation Laboratory.**
- **Automatic Control Laboratory.**

"In these years, the CIIB has allowed us to (i) establish an infrastructure, equipment and management platform that facilitates the generation of knowledge and its applicability in the biomedical field, (ii) facilitate interaction between researchers of different disciplines and the development of interdisciplinary projects, (iii) optimize resources through common services and efficient management structures, and (iv) integrate the University with the local, national and international environment in the biomedical area".

Federico Bátiz
Director of the Biomedical Research and Innovation Center.

"The development of experimental and, above all, applied work goes hand in hand with structural challenges regarding adequate spaces and advanced equipment. In that sense, the PMI contributed in granting tools that will favor joint work between engineering sciences and biomedicine, where there will be many instances of collaboration in which the strengths of each area can be decisive at the time of finding solutions that favor our society or that enhance the development of science".

Sichem Guerrero
Director of the Bioengineering Center.

"Technology is best when it brings people together ".

Matt Mullenweg,
Creator of the content management system WordPress.

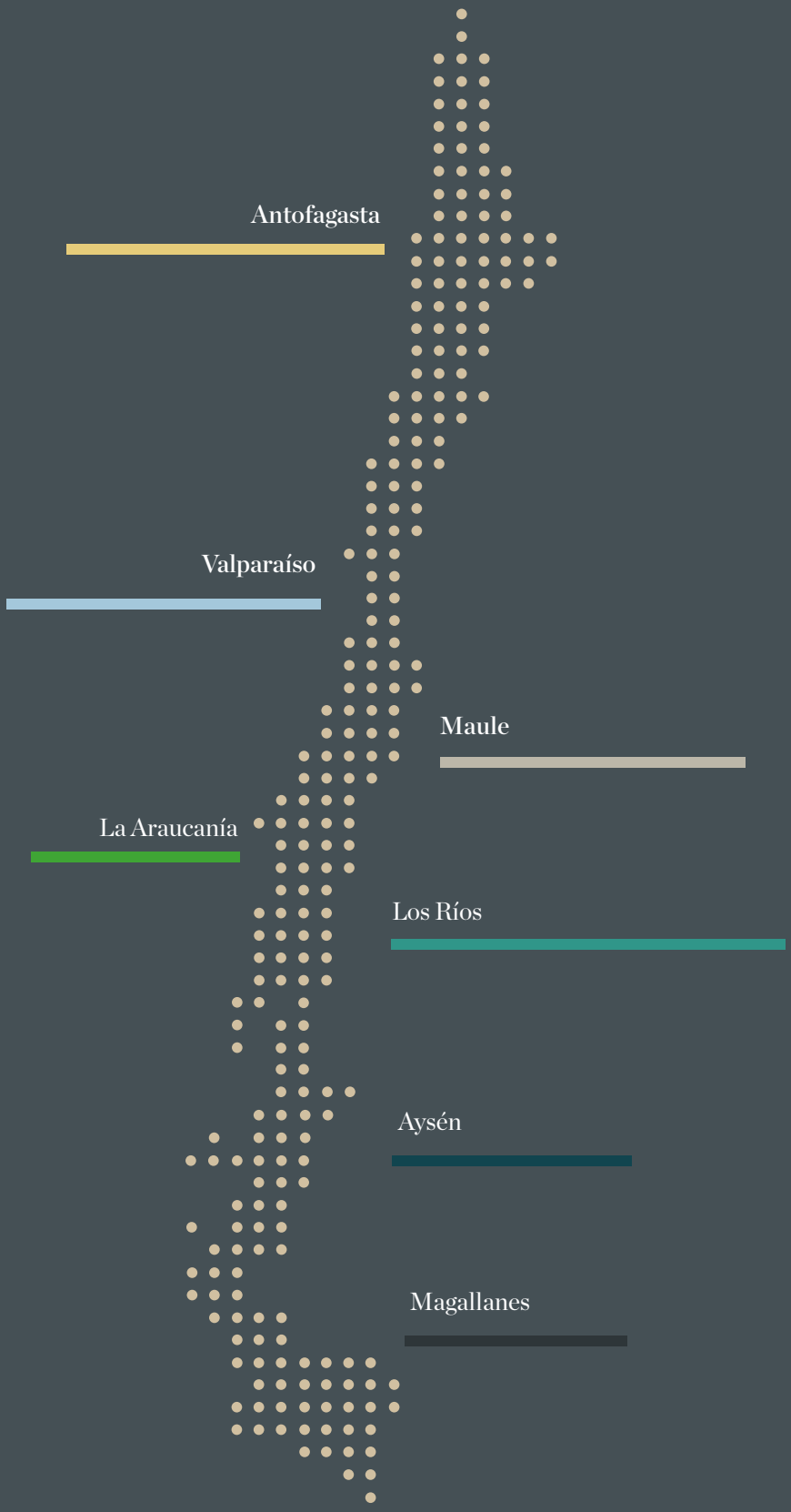
03

Network

DESCENTRALIZING
CHILE'S INNOVATION

With the strong conviction that the science developed in the country is of excellence, the Innovation Department has been forming strategic alliances with different national actors to encourage and create a network of scientific collaboration and technological transference.

The creation of an innovation hub with other universities and scientific-technological centers has managed to integrate the work that each entity did separately. The alliances signed with Universidad de La Frontera and Universidad Austral de Chile ratify that the exchange is beneficial for all parties and that it is possible to work together in service of the country.


Antofagasta
Valparaíso
Maule
La Araucanía
Los Ríos
Aysén
Magallanes

UANDES AND UFRO, AN ALLIANCE THAT IMPACTS THE COUNTRY

This relationship has strengthened networks and has managed to expand research between both institutions.

Eduardo Hebel, UFRO Dean and José Antonio Guzmán, UANDES Dean.

One of the main milestones that has marked the relationship between Universidad de los Andes and Universidad de La Frontera de Temuco (UFRO) is the Start your Idea contest, where researchers from both entities present a joint project. Since the signing of the cooperation agreement, in 2015, three versions of the contest have been held, where 38 initiatives have been presented.

During the last call, made in 2018, there were 12 proposals from academics and researchers, and a jury, made up of experts and authorities of both universities, chose four projects that would be worked on between UANDES and UFRO researchers. The winners of the third version were Úrsula Wyneken, research professor of the Faculty of Medicine; Sichem Guerrero, research professor of the Faculty of Engineering and Applied Sciences, and teachers and researchers from the Faculty of Dentistry, Alejandra Chaparro and Ziyad Haidar.

This novel and unique contest has boosted research, encouraging the participation of researchers from both universities so that they jointly develop an R+D+i project in its initial stage and advance in in generating a scalable technological solution to address a challenge/ problem/opportunity of a national or international relevant economic sector.

The cooperation agreement that kickstarted the Start Your Idea contest was ratified in March 2018 by the presidents Raúl Sánchez, of UFRO and, José Antonio Guzmán, of UANDES, to continue strengthening the networks, and expanding investigation. This alliance has contributed in the development of 10 projects of scientific research in different areas, which have been supported by the UANDES Innovation Department and the UFRO Innovation and Technological Transference Department.

INICIA TU IDEA CONTEST RESULTS
2015–2018

PRESENTED PROJECTS	*41*
APPROVED PROJECTS	*15*
EXECUTED PROJECTS	*4*
NUMBER OF UANDES PARTICIPATING ACADEMICS	*49*
NUMBER OF UFRO PARTICIPATING ACADEMICS	*59*
APPROVED GLOBAL AMOUNT	*US$ 121.709,305*

A NEW COOPERATION AGREEMENT

Education, research, innovation, technological transference, among other subjects, will be addressed in the agreement signed between UANDES and Universidad Austral.

Signed at the beginning of 2019 with a five-year validity period, the agreement between Universidad Austral de Chile (UACh) and Universidad de los Andes (UANDES) aims to establish cooperative relations between both institutions. It seeks to enhance teacher and student exchanges, joint research and innovation activities and programs, participation in seminars and academic meetings, and exchange of materials and short-term special academic programs.

The agreement was signed at the UACh Isla Teja Campus in Valdivia, where the Austral University President, Óscar Galindo, stated that with this agreement both houses of study will benefit each other in different areas, in addition to collaborating and working at the service of the country.

“We hope to share a lot of information and get our academics in touch with each other. Collaboration agreements come to life when academics effectively get to know each other, work together and develop projects. You, fortunately, have already built this experience with a southern university very close to our own institution, Universidad de La Frontera”, affirmed Galindo.

TRUSTED NETWORKS

Universidad de los Andes President, José Antonio Guzmán, highlighted the creation of trust networks, the importance of critical mass and the opportunity to learn from Universidad Austral de Chile and other higher education institutions. “We are a young university and have existed for half as long as you”, he said. “The framework agreements are a starting point, but they do not come to life until deep trust relationships are created among the institutions at the level of the higher authorities and, above all, at the level of academics. In this sense, when an important link is created it becomes permanent, because trust is a very important engine”.

Meanwhile, Luis Alejandro Silva, UANDES Vice President of Research and Postgraduate Programs, indicated that the collaboration between both universities marks the beginning of a relationship that can bear many fruits for the country. “Both universities have potentialities that will bring out the best in each and the link that will be generated to promote joint research will deliver tools to solve real problems for the benefit of the people. This is an agreement that will be increasingly beneficial for all of us and the country”.

José Antonio Guzmán, UANDES Dean; Oscar Galindo, UACh Dean, and Hans Richter, UACh Vice-Rector of Research, Development and Artistic Creation.

"Both universities have potentialities that will bring out the best in each and the link that will be generated to promote joint research will deliver tools to solve real problems for the benefit of the people. This is an agreement that will be increasingly beneficial for all of us and the country"

Authorities of both universities visiting the Electron Microscopy Unit of Universidad Austral.

BOOSTING THE ENTREPRENEURSHIP AND INNOVATION ECOSYSTEM IN ANTOFAGASTA

UANDES and Regional Government of Antofagasta authorities at the first lecture of the “The Challenge of Accelerating Innovation” series.

One of the great milestones of the Innovation Department during 2018 was the materialization of the yearning to work in conjunction with the UANDES Faculty of Economic and Business Sciences. Francisco Ulloa, professor and Vice-Dean of students of said faculty, was awarded a CORFO fund for the Entrepreneurship and Innovation Environment Support Program (PAEI).

The public funds obtained will be allocated to organize the fourth version of the Challengers tournament, a contest aimed at national high school and university students.

The competition, in which more than 1,500 students from 270 schools have participated, is carried out in three stages. In the first, students attend an academic seminar where they are given useful tools to develop their projects. There, the young people are presented with a case, a social impact problem, that they must solve with the creation of a business venture. In the second stage, each team must develop its project and the final stage is Pitch Day, where the participating groups present their businesses. The winners are awarded a trip to an attractive country in terms of innovation and entrepreneurship. So far, the destinations have been United States and China, and, for the current version, is set for Dubai.

Until 2018, this contest had only been developed in establishments located in the Fifth and Metropolitan Regions but, thanks to the allocated public funds, the tournament will also be held in the Region of Antofagasta.

In addition, the Innovation Department was awarded a PAEI to support and encourage innovation in the Region of Antofagasta.

In conjunction with the Mining and Industrial Training Center (CEIM) and the support of the regional government of Antofagasta, six talks will be given to investors, entrepreneurs and SMEs, seeking to unite companies with individuals that have innovative ideas and provide them with tools to commence these processes.

UNIVERSITIES UNITE TO BOOST **TECHNOLOGICAL TRANSFERENCE**

The model emerged as a CORFO initiative, which contributed US $7 million to develop the idea and bring together several entities.

The creation of opportunities that promote multidisciplinary work and aspire to make science a crucial piece within the wealth and diversification of the Chilean economy is what has driven the work of HubTec Chile these last three years, in which the collaboration between the different actors of the ecosystem has been key.

Since its creation in 2016, HubTec has stood out as a technological and scientific transference center, which articulates and manages its network capabilities to transform its partner's different projects into solutions that make a positive impact on society.

HubTec Chile arose as a CORFO initiative with the purpose of creating an associative model between universities, professional institutes, scientific-technological centers and other entities that have regional participation and relevant Innovation and Development (I+D) critical mass on a national level and have specialized technological transference capabilities.

By this principle, the state entity contributed more than US $7 million in funds so that different agencies could increase their numbers of technological ventures based on R+D+i results.

Miguel Sifri, chairman of the HubTec board, stated that the objective is to effectively and efficiently transfer technologies from higher education institutions. "We believe that this process will help guide the research conducted in universities today to the requirements of the industry, to the needs of the country and the world in general, as well as to be able to generate networks."

Authorities of the seven universities that made up HubTech Chile.

Sifri affirmed that his biggest challenge is to have a balanced portfolio including different stages of development and short/ medium term success stories that validate the model. “Our country needs to advance to a different stage of development than where it is today, so that we can position it as a reliable actor in the world of technological transference.”

HubTec Chile is made up of seven universities and four scientific-technological centers, six of which are in different regions and eight in Santiago. The institutions who lead this initiative are the Pontificia Universidad Católica de Chile, Pontificia Universidad Católica de Valparaíso, Universidad de La Frontera, Universidad de Valparaíso, Universidad de Los Andes, Universidad del Desarrollo, Universidad Andrés Bello, Universidad de Magallanes, the Regional Center for Food and Health Studies, the Chilean Commission of Nuclear Energy, and the Water Technology Center.

In addition, there are four coexecuting agencies that will support the achievement of the objectives: Fundación Chile, Fraunhofer Chile, UC Davis Chile and Inria Chile.

One of the study houses that promoted the creation of this hub was Universidad de los Andes, where Matías Vial, Former Director of Innovation and current Vice-Rector of University Relations, was at the head of the process.

“Up to now, CORFO had supported the Transfer and Licensing Offices (TTO) with financing, but it was noted that there was a critical capacity gap for effective technological transference, and that it would be more efficient if, in addition to maintaining the “on campus” TTO capabilities, another external, “off campus”, vehicle was created, with independent management and high professional capacity specialized in marketing and transferring those technologies to society”, explained Matías Vial.

STRENGTHENING LINKS BETWEEN **ACADEMIA AND INDUSTRY**

During these years, the Innovation Department has established partnerships with various sectors and industries of the market, forming bonds that have consolidated over time and generated important results, which are finally translated into benefits for society.

One of the Department objectives has been to establish a link between academia and companies, so that both can benefit and find common ground to solve problems that seek and offer real solutions to people.

JORGE RODRÍGUEZ
General Manager of Invexor.

"We have been working with the Universidad de Los Andes Innovation Department for the last two years and have been surprised by the very high work standard they have. This has meant that, as investors, we are highly interested in the projects that are being developed. In particular, Invexor is committed to Pregnóstica, where we hope to achieve, in the short term, the big success that this technology promises."

ARIEL GRINGAUS
Founding member of Colegium.

"Since we formed Colegium, in the year 2000, we have worked towards solutions so that educational establishments optimize their processes and can truly contribute to the quality of education. With that goal in mind, we partnered with the Innovation Department in 2016 and developed DIA+. It was an excellent joint job, where we managed to merge Colegium's technical ability with the university's pedagogical and research expertise. The results of this will allow us to improve the in-classroom experience with technology and innovation."

CARLOS VIAL
Director of Chabuco Inversiones.

"Since we started working with Universidad de Los Andes, we have realized that they are very committed to making their technologies into real contributions for people, and that has been very satisfactory, because they get involved in the whole chain of processes that are required. Our interest was born because we saw the potential that Gel'X has and we decided to bet that this research is a contribution not only to the salmon industry, but to the food industry, a sector where Chile should be a major economic power."

MIGUEL SIFRI
President of Proteus.

"I see the Innovation Department as very well focused, with talents from various parts of the world, and that has been capable of creating companies and approaching the private world, which is rare. An important advantage is the quality of their human resources, which is first level. I also emphasize the interesting international benchmark that they performed to identify how others have addressed innovation issues and how to adapt those realities to our country."

PATRICIO JARPA
Nanotec partner.

"Nanotec is a company that has been innovating since it was formed. What we have been doing with Universidad de los Andes and the Innovation Department continues in that same line, and fully represents us as a company. We're constantly looking for solutions based on copper nanoparticles and what we discovered with UANDES is that there are entire areas, such as dentistry, where we had not explored and that are very beneficial to the population".

GUILLERMO CAREY
Carey Abogados partner.

"To be successful you must be constantly evaluating progress, and the Innovation Department is always measuring their results, which is very necessary to succeed. The above leads to them having more than 80 patent applications. I appreciate that, besides an Intellectual Property policy and regulation, they possess a good corporate governance base, which shows maturity in what they are doing, and they are quite advanced and consolidated within the Venture Capital ecosystem on a national level."

JORGE CARPINELLI
Director of UST National Applied Research and Innovation.

"It seems to me that the Innovation Department has a modern and agile structure, which, though result oriented, also works on building an institutional culture around innovation and technological transference, and which, in light of the visible results, has been very positive. It has a warm and professional team, with whom I've had the opportunity to spend time."

INTERNATIONAL
PARTNERS NETWORK

Founded in 2010, the Innovation Department has sought, from its beginning, to bring together the best practices and international methodologies and thus form a network of support and collaboration with the world's leading innovation representatives: Harvard, UC Davis, MIT, UCLB, KiwiNet or the University of Queensland, to name a few.

Over time, it has managed to position itself as a reference within Latin America, organizing seminars and courses with important experts from the United States and the United Kingdom.

Along with this, it is the first university in the region to sign a strategic alliance with two important international actors related to technological transference: IN-PART and Praxis Auril.

Universidad de los Andes


MIT
HARVARD UNIVERSITY
Berkeley
UNIVERSITY OF CALIFORNIA
Stanford University
UC San Diego
Procopio
UCDAVIS
UNIVERSITY OF CALIFORNIA
NIH
UNIVERSITY OF TORONTO
Université de Montréal
Casa abierta al tiempo
UNIVERSIDAD AUTÓNOMA METROPOLITANA
UNIVERSIDAD DE PIURA
HubTec
Inserm
UNIVERSITÉ DE MONTPELLIER
UNIVERSIDAD AUSTRAL
UNICAMP
KiwiNet
uniservices
Universitat Internacional de Catalunya
POLITÉCNICA
UNIVERSITAT DE BARCELONA
UNIQUEST
THE UNIVERSITY OF QUEENSLAND
AUSTRALIA
Yissum
RAMOT
AT TEL AVIV UNIVERSITY LTD
CATAPULT
UCLB
SINTEF
Nofima
Hoffmann
sopartec
Making science investable

UNIVERSIDAD DE LOS ANDES AND HARVARD UNIVERSITY
SIGNED SCIENTIFIC COOPERATION AGREEMENT

Both institutions committed to the exchange and training of experts, scientists and technicians; scientific information and technological transference; and sharing market strategy for intellectual property.

Universidad de Los Andes (Chile) and the University of Harvard (Boston, United States), through its Harvard Stem Cell Institute (HSCI), signed a scientific cooperation agreement, in which they committed themselves to developing a program in the field of regenerative medicine, specifically of 3D printed human skin, derived from the collagen of Chilean salmon.

The agreement signed between both universities implies the exchange and training of experts, scientists and technicians; scientific information and technological transference; and sharing market strategy for intellectual property. The purpose of this agreement is to develop models to build skin prostheses that contain stem cells to heal wounds and regenerate skin.

Thanks to this agreement, Phammela Abarzúa, Master of Science in Engineering and University researcher, spent six months in the HSCI laboratories evaluating the behavior of the biomaterial in 3D printers designed by the engineers of Harvard University, succeeding in validating the versatility of the biomaterial.

The HSCI is a Harvard unit that represents professors dedicated to the research and application of stem cell science and related technologies, within the University faculties and hospitals affiliated with this house of studies.

UANDES authorities with Brock Reeve, director of the Harvard Stem Cell Institute (HSCI).

A SUBSTITUTE FOR HUMAN SKIN

The technology that caught the attention of the HSCI was developed by two UANDES Faculty of Medicine academics, Javier Enrione and Juan Pablo Acevedo, together with the spin-off Cells for Cells (C4C), and was supported by the Innovation Department.

Both scientists managed to create a bioink for 3D printing from salmon industry waste, which has the potential to be used in different types of printers allowing cell growth. The first prototype aims to develop a human skin substitute suitable for regenerating this organ in patients with burns or wounds, among others.

NETWORK

SUPPORT FOR **ENTREPRENEURS AND INVESTORS**

In 2017, the Innovation Department applied to the Entrepreneurship and Innovation Environment Support Program (PAEI), a CORFO financed instrument to guide and train investors in the advantages of investing and supporting research in the area of Life Sciences.

The event, held at Matetic vineyard, convened more than 30 people linked to different investment funds and state entities, who participated in international expert talks on the risks and profits of the Life Science industry, how to invest in Chile and the region, steps to follow regarding Intellectual Property and how to prepare a company to raise funds.

Silvana Becerra, Deputy-director of Technological Development and Marketing, said that any type of training is a contribution to the ecosystem, especially in the area of innovation, where expectations and results can go in separate ways.

“The gap in investment in our national technologies, compared to the United States, is very high. In this sense, PAEI contributes to both worlds, because, on one hand, scientists are focused on developing their technologies and are frequently unable to see other sides -like financing- that are also important, and on the other, investors need to understand the basic business technology”, said Silvana Becerra.

This is the third experience that the University has with this type of program, since a PAEI was awarded for the first time in 2015. On that occasion, the initiative was aimed at entrepreneurs who were interested in the area of Life Sciences. The objective was to give them tools to face investors when searching for funds.

OUTCOME

70
Entrepreneurs trained

32
Investors trained

8
International conferences

1
Guide /publication

FIRST BIOTECHNOLOGY CONGRESS IN LATIN AMERICA

Universidad de los Andes, in collaboration with TTSGlobal Initiative, CORFO, the Hub's, Carey Lawyers, and Ganeshalab, convened more than 200 people from the national ecosystem and 15 international exhibitors from Europe and the United States.

For two days, the national ecosystem of science and innovation's main exponents got together at the Third Technological Transfer Summit TTS Latin America. The event was organized by the UANDES Innovation Department and TTS Global Initiative, with the collaboration of CORFO, the Hubs of technological transference, Carey Lawyers, Ganeshalab and Red GT. The activity gathered more 200 people, who attended the conferences on innovation, market transference, funding, and spin-off in charge of international experts.

On the occasion, issues regarding the interests of the different Transfer and Licensing Offices (TTO), investors and researchers were addressed. Along with the above, the experiences of different international actors, such as universities, incubators, accelerators, investment funds and companies that are actively moving disruptive technologies from the laboratory to the market, were presented.

During the event, networking instances were generated between attendees and exhibitors; there were also discussion panels on issues such as the creation of innovation policies and the construction of a high-impact national ecosystem, how to build synergies between different research stages, innovation and market access. Other aspects addressed were the best practices in technological transference, Intellectual property, how to get financing in the initial stage and what international investors are looking for.

ANIL SADARANGANI
Director of Innovation UANDES:

"It is sometimes said that Chile is far away, geographically and in terms of capabilities, from the international biotech poles, thus making us a country without innovative and research potential. Instances like these show the true level we have reached."

MARCELA ANGULO
Former Manager of Technological Capabilities of CORFO:

"After having the privilege of listening to the different speakers, it must be said that Chile is very far away from all the pharma industry, so we must find our own model, but always connected internationally."

MAGALI MAIDA
Vice President of RedGT:

"This was a space of great value, because we were able to group the different actors of the biomedicine ecosystem, which has led us to look at where Chile is located in these issues and at the upcoming challenges in order to position ourselves on a global scale, besides being able to share good practices and extend our networks in Chile and abroad".

BERNARDITA ARAYA
Executive Director of HubTec:

"Considering the experience of technological transfer to date and the speed at which science advances in the world, we must work so that there is a permanent update between public policies, the private sector, universities and research centers".

SANDRA ARAYA,
Apta Hub representative:

"Instances such as the TTS Latin America are very relevant for the actors that participate in activities related to technological transference, innovation and entrepreneurship, since they shared their experiences on successful models of innovation, NETWORK with the industry and what it is that investors consider a good business opportunity. In addition, it was a chance to spend two days with the entire national ecosystem, which allows us to align visions and generate collaborations to give more strength to the activities that are carried out by the government, the TTOs, technological transference HUBs, incubators, accelerators and local investors."

CHRISTIAN J. SUOJANEN
TTS Global Initiative co-president:

"This is exactly what we want to achieve with the TTS: a highly interactive summit that offers valuable debates, knowledge exchange and new connections and relationships that will contribute to the accelerated development of this sector in Chile. This was an opportunity to highlight the achievements to date within the ecosystem. The TTS brings together international experts and leaders of Chilean innovation in an initiative that seeks to encourage greater interaction and commitment in the future".

UANDES TECHNOLOGIES
EMERGE TO THE WORLD

Is the first university in Latin American to be part of IN-PART and Praxis Auril.

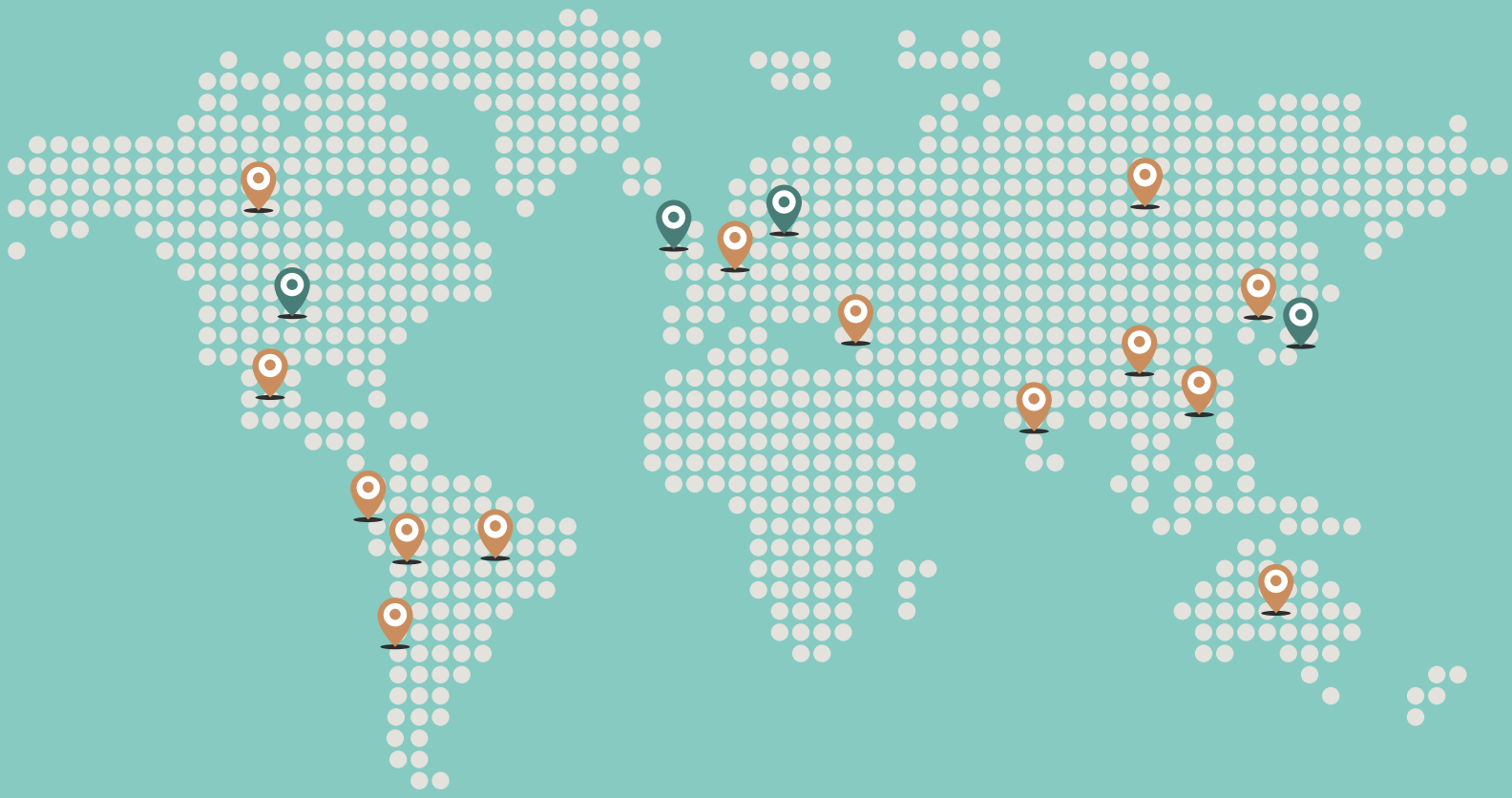
The UANDES Innovation Department signed a strategic alliance with two important international actors related to technological transference: IN-PART and Praxis Auril, being the first Latin American institution to enter both circles.

The agreement with Praxis Auril, which has more than 173 member institutions, meant entering into the network of technological transference actors from the United Kingdom, which are a part of ATTP, an alliance covering the 11 knowledge and technology transference associations worldwide, seeking to promote and maintain global standards in the transference of technologies to the market.

IN-PART, on the other hand, is a platform that brings together the main technologies that are developed in different universities, such as Cambridge, Stanford, Nottingham and Queensland, among others, and connects them with different businesses. It is a bridge to promote innovation and intelligently NETWORK market requirements with the investigations that are carried out in the houses of study, giving way to important alliances.

The platform has highlighted two UANDES technologies: X'Plant 3SS Dental, a tool for removing dental implants through the combined use of thermal energy and ultrasonic vibrations, and Incure, biotinta formulated from biopolymers of cold-water marine species for high resolution 3D printing.

GLOBAL IMPACT



COUNTRIES WITH GRANTED PATENT

Germany, United States, Japan and the United Kingdom

COUNTRIES WITH PATENT REQUEST

Australia, Brazil, Chile, Colombia, China, Canada, France, Hong Kong, India, Israel, Korea, Mexico, Peru and Russia.

"Keep exploring. Keep dreaming. Keep asking why. Don't settle for what you already know. Never stop believing in the power of your ideas, your imagination, your hard work to change the world".

Barack Obama,
President of the United States 2009 – 2017

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Impact

SUCCESS STORIES IN TECHNOLOGY TRANSFER

Technological Transferences

Institutional Improvement Plan (PMI) in Innovation

MEDICINE

DENTRISTRY

regenero

KiVa

R.A.D.A.R

CELLS FOR CELLS
CELL THERAPY EXPERTS

PREGNÓSTICA
Predecir para prevenir

LEVEL
Level Bioscience

DFK
DENTAL FORENSIC KIT

Dia+
Diagnóstico Oportuno
para Aprendizajes de Calidad

Dialect
Universidad de los Andes

Diamat
Universidad de los Andes

SORT BOX

SUCCESS STORIES IN TECHNOLOGICAL TRANSFERENCE

Roberto Bobadilla, CEO of Cells for Cells and Regenero.

CELLS FOR CELLS (C4C)

C4C was born in October 2010 as the first Universidad de los Andes spin-off; however, cell therapy research began in 2005, with doctors Fernando Figueroa, then Dean of the UANDES Faculty of Medicine and current Director of the Cell Therapy Program, Jorge Bartolucci, former president of the Chilean Society of Cardiology (Sochicar), and Flavio Carrión, from the UANDES Cellular and Molecular Immunology Lab. They formed the Cell Therapy Laboratory of this house of studies, a national pioneer in its field.

Given the good results, Dr. Figueroa, along with Matías Vial, the UANDES Innovation Director at the time, motivated a group of private investors to form a biotechnology company that could develop and market cell therapies.

With the objective of incorporating advanced human capital, they hired Maroun Khoury, Ph.D. in Gene Therapy by the University of Montpellier in France, and post-doctorate at the Koch Institute of MIT (Massachusetts Institute of Technology) of the USA, as Scientific Director. Khoury managed to generate international alliances with both universities, and that was how the consolidation process of the research area and the development of C4C began.

REGENERO

The third UANDES spin-off is a platform able to develop cellular therapies for degenerative diseases with high economic and social impact, such as lupus, diabetes mellitus and skin ulcers.

The general objective of the Consorcio project Regenero is developing the cell therapy industry in Chile, and along with it, new world class products, by strengthening national research and development capabilities, the creation of a transnational medicine platform, and the promotion of a local regulatory framework to provide therapeutic alternatives with high commercialization potential.

PREGNÓSTICA

Preeclampsia, gestational diabetes and premature delivery are complications that occur during pregnancy and that adversely affect both the mother and the future newborn and that, until now, can only receive treatment once the pathology presents itself. With this late treatment, none of the effects of these conditions can be avoided.

Gestational hypertension (preeclampsia and eclampsia) affects between 5% and 8% of all pregnancies worldwide and is responsible for a quarter of global perinatal mortality, causing 20% of premature births. In addition, a mother who had gestational diabetes increases by 50% her risk of developing type 2 diabetes mellitus after pregnancy and her child's risk of being diabetic, obese or presenting other metabolic problems increases in five times.

Aiming to detect these diseases in their asymptomatic phase, at the beginning of the pregnancy, and trying to reverse this indicator, the Pregnóstica team, led by the Faculty of Dentistry researcher Alejandra Chaparro and the gynecologist and Faculty of Medicine researcher Sebastián Illanes, investigated the development of an early predictive diagnostic method, which permits the identification of patients at risk of presenting one of these two diseases.

"Through the Innovation Department we managed to obtain funds that allowed us to identify biomarkers capable of predicting pregnancy diseases, protect our invention with patent applications in different countries, and constitute the fourth spin-off of the University, after eight years of research. It has been a long, learning-filled journey, both in scientific terms and in innovation subjects so necessary for making our technology useful for patients", said Alejandra Chaparro.

What makes Pregnóstica unique is the chance to make the diagnosis in the first trimester of pregnancy (week 11-14) and through a simple, painless, minimally invasive and inexpensive dental examination.

Greg Rice, CEO of Pregnóstica.

TIMELY DIAGNOSTICS FOR QUALITY LEARNING

Dia+ is a technological platform for diagnosis of reading and mathematical skills in kindergarten through fourth grade children. The Dialect® evaluation allows an individual, self-applied and integral diagnosis of early reading skills, and Diamat® seeks to measure the Mathematical competence in the different curriculum core areas.

Both tests provide a real-time report with a performance analysis of the evaluated students and general suggestions of areas to strengthen. This way, the information necessary to formulate a specific action or intervention plan to address those areas in need of support is given to the teacher, according to each student's needs.

Pelusa Orellana, Vice-Dean of Research of the Faculty of Education.

From the beginning, both platforms focused on early educational levels, because research on the subject and internationals studies showed that it is the best moment to identify difficulty areas and address them. However, they are currently developing instruments to extend the diagnosis until high school.

Both platforms have been co-developed with the national company Colegium, who have been key partners, as they have digitized and improved access to the tests, along with making their networks available in the Chilean and Latin American educational system.

Since its creation, more than 40,000 Chilean and Argentinian students have been evaluated with Dialect and Diamat, and by 2019 it is expected that this figure will quadruple.

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THE DIA+ PROCESS

Customized diagnostic evaluations.

Pedagogical proposals.

Identification of strengths and weaknesses.

CARE FOR ADOLESCENTS AT SUICIDE RISK AND REFERRAL NETWORK

According to studies by the National Institute of Statistics (INE), Chile has the highest suicide rate in Latin America, doubling the youth mortality rate in Latin America and the Caribbean. Within this context, the Network for Attention and Referral of Adolescents at Suicide Risk (R.A.D.A.R) is born. This project is a program for the early detection of adolescents at suicide risk created by UANDES doctors and nurses and directed by Dr. Francisco Bustamante, who were contacted in 2009 by the community of Puerto Aysén, locality that triples the suicide rate nationwide.

In this municipality, the group of experts managed to detect that, of a total of 144 young people between 15 and 18 years, 17% presented suicide risk, and of these, 91% were not receiving psychiatric care. The specialists observed four factors that could explain the problem that the city was experiencing and designed a specific intervention for each one. Today, the R.A.D.A.R. team can actively or passively detect a teenager at suicidal risk.

The initiative, unprecedented in the world, involves the whole school community, that is, students, professors, guardians and relatives, in addition to the municipality and the health service, thus establishing an effective collaboration network. Furthermore, it constitutes a low-cost tool that can be extrapolated to other regions and incorporated into the country's public policies.

Francisco Bustamante, Program Director of Radar and Academic of the Universidad de Los Andes Faculty of Medicine.

Pablo Zegers, former professor and researcher of Engineering UANDES

SORTBOX: THE ALMOND SORTING MACHINE

The almond market in Chile has been characterized by the manual selectivity, where this fruit's valuation and price has different categories depending on whether or not it has a peel, skin or is chopped. Its classification is fundamental; however, the shortage of manual labor has turned into a problem for the industry.

Facing the dilemma presented by medium and small farmers, Juan Ignacio Tocornal, Engineering alumni and owner of Agrícola Las Mellizas, proposed to Pablo Zegers, Ph.D. and former professor at the University, that they develop a low-cost multi-selection machine for almond sorting. After years of work, the technology is able to detect and select these fruits with great accuracy and speed (40 almonds per second), separating the damaged ones faster and more efficiently, boosting the production of plantations.

CLINICAL **TRIALS**

The UANDES Faculty of Medicine researchers and Medical Directors of C4C, Fernando Figueroa and Francisco Espinoza, lead clinical trials.

450

PATIENTS TREATED

5

CLINICAL TRIALS*

***Definition:** Prospective study in humans that compares the effect and utility of an intervention with one of control.
Excerpted from "Fundamentals of Clinical Trials", by Lawrence M. Friedman, Curt D. Furberg, David L. Demets. Springer. New York, 2003

PATHOLOGIES

Heart failure	Cell for Cells
Orteoarthritis of the knee	Cell for Cells
Irreversible Pulpitis	UANDES
Venous Ulcer	UANDES
Lupus	UANDES / Cell for Cells

OUR **RECOGNITIONS**

The Technology Transfer Office (TTO) has been awarded by CORFO and the RedGT.

The Universidad de los Andes Innovation Department has led technological transference at national level in recent years, which has been highlighted by CORFO and the Network of Technological Managers (RedGT) for the work they have developed with various investors, the role that the University has played in attracting new actors and investors to familiarizing themselves with the Chilean ecosystem, and the contribution towards society.

Universidad de los Andes 30 años

1ST UNIVERSITY IN INNOVATION

FOR THE SECOND CONSECUTIVE YEAR

SCIMAGO INSTITUTIONS RANKING
INNOVATION RANK 2019

1. **UNIVERSIDAD DE LOS ANDES**
2. UNIVERSIDAD ANDRÉS BELLO
3. UNIVERSIDAD DE SANTIAGO
4. PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE
5. UNIVERSIDAD DE CHILE

"Universidad de Los Andes, in its eagerness to contribute to society, has conducted applied research at a high level, developing innovative projects with great impact in biomedicine and other disciplines, which has meant being recognized by this prestigious international ranking".

Anil Sadarangani, Director of Innovation

Comisión Nacional de Acreditación CNA-Chile

UNIVERSIDAD ACREDITADA | 5 AÑOS
Hasta diciembre de 2022.
Gestión Institucional, Docencia de Pregrado, Investigación, Vinculación con el Medio y Docencia de Postgrado.

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INSTITUTIONAL **CHALLENGES**

The progress that has been achieved during these years cannot be stopped, we must make the ideas that have been brewing come to life.

The achievements that have been accomplished so far position Universidad de Los Andes within the main institutions in Biomedicine and Bioengineering research. It is for this reason that the University has set certain institutional challenges that mean assuming a corporate commitment to sustain these changes in time.

MAIN INSTITUTIONAL TRANSFORMATIONS

The main transformation is the incorporation of innovation based in interdisciplinary science in the institutional culture. From this point of view, the Innovation Department has been a vehicle that allows generating the conditions for applied and collaborative research between professionals from the field of biological and health sciences, along with engineering.

SUSTAINABILITY MECHANISMS AND INSTITUTIONALIZATION OF ACTIONS

A factor that contributes to the sustainability and projection of the generated changes is the incorporation of applied research when making institutional strategy plans, and, from there, to those of the faculties and

Presidential Council of the University, formed by the President, the General Secretary, the six Vice Presidents and the two Directors.

schools, especially those that have been most involved with the Innovation Department. Another factor is a consequence of the previous one, since it was decided to continue to promote the lines of applied research developed during the PMI, which, among other aspects, involves the allocation of human and financial resources to continue supporting them, as well as the Nuclei of Bioengineering Research and Innovation, created by the University in 2017.

CHALLENGES FOR INSTITUTIONALIZATION

The main challenges are to achieve high impact results with research developed in the University (scientific, social, economic, financial); and, likewise, to ensure the resources that allow consolidating and strengthening the body of researchers, in addition to improving and increasing infrastructure.

INNOVATION UANDES

R+D+i

2016–2019

Universidad de los Andes 30 años

Comisión Nacional de Acreditación CNA-Chile

UNIVERSIDAD ACREDITADA 5 AÑOS

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