PLIVA ANNUALLY MANUFACTURES

5.5 billion tablets

30 million injections

10 million tubes of creams and ointments
Dear Readers,

There are only a few companies in Croatia or worldwide which can take pride in the long research and development tradition that PLIVA can. At PLIVA, research and development of new products began 75 years ago: the first organised research projects date back to 1936, and they resulted from co-operation with the University of Zagreb’s Prof. Vladimir Prelog, later a Nobel Prize Laureate for chemistry. A team of industrious researchers achieved the then enviable scientific results in the field of sulphonamides: the development of manufacturing procedures for several products enabled PLIVA to become a leader in the modern production of medicinal products in this region. From 1936 to the present day, Research and Development has been the principal driving force behind the development of new products and use of new technologies.

The discovery of azithromycin was a milestone in both PLIVA's history and the history of the pharmaceutical industry in general. This discovery made PLIVA one of the few pharmaceutical companies with an in-house developed original medicine, and Croatia one of the few countries with its own antibiotic.

PLIVA's success to date, and its current status, can be greatly attributed to its in-house research and development. The information about research projects gathered on the global level and the optimal use of knowledge and equipment are the prerequisites for the achievement of business goals and strategy in the forthcoming years.

Zagreb's Research and Development is one of the most important R&D centres in the Teva Group. The purpose of its development projects is to develop new chemical synthesis routes, new manufacturing procedures for active pharmaceutical ingredients and new medicines by using various technologies based on scientific principles. In 2011 Teva's research and development expenditures amounted to about 7% of revenues or almost a billion dollars. PLIVA earmarks a similar percentage to its research and development projects.

Throughout its history PLIVA's Research Institute has employed more than a thousand scientists, many of whom spent their entire years of service at PLIVA or became university professors or academics, including one Nobel Prize winner. Many pursued their careers at renowned universities worldwide. PLIVA's traditional co-operation with the scientific community in Croatia and abroad has remained intensive and is primarily focused on numerous joint projects with Croatian and foreign universities and scientific institutions.

PLIVA's Research and Development currently employs about two hundred scientists and researchers of differing profiles, of whom about forty hold M.Sc. and Ph.D. degrees. Their task, at the Teva Group level, is to design new products – active pharmaceutical ingredients and finished dosage forms – for markets worldwide. Since PLIVA is the only pharmaceutical company in Croatia with vertically integrated production, Research and Development plays an invaluable role in the company’s entire business operations. The results of these activities are about twenty projects per year for target markets in the EU, the USA and Croatia.

Since 2008 PLIVA has operated as a member of Teva, one of the largest pharmaceutical companies worldwide, and PLIVA's site in Zagreb has become one of the strategic production sites for the Teva Group.

PLIVA CROATIA
PLIVA MILESTONES

IN KARLOVAC, THE COMPANIES ISIS (ZAGREB) AND CHINOIN (BUDAPEST) FOUNDED THE COMPANY KAŠTEL D.D., PLIVA'S PREDECESSOR. THE PRODUCTION OF DOMESTIC HERB EXTRACTS BEGINS.

1921

PLIVA'S OXYTETRACYCLINE PRODUCTION PLANT RECEIVES APPROVAL BY THE US FOOD AND DRUG ADMINISTRATION (FDA), THE FIRST OF MORE THAN 30 DMF SUBMISSIONS APPROVED BY THE FDA.

1965

PRODUCTION IN THE NEW FACILITY FOR FINISHED DOSAGE FORMS STARTS. ONE HUNDRED AND THIRTY TWO NEW MEDICINES ARE MANUFACTURED, 58 OF WHICH ARE BASED ON ORIGINAL FORMULATIONS.

1971

PLIVA'S ORIGINAL MACROLIDE ANTIBIOTIC AZITHROMYCIN IS PATENTED.

1980

AZITHROMYCIN IS LAUNCHED UNDER PLIVA'S BRAND NAME SUMAMED.

1988

AZITHROMYCIN IS LAUNCHED UNDER PFIZER'S BRAND NAME ZITHROMAX ON THE US AND WESTERN EUROPEAN MARKETS.

1991

PRODUCTION MOVES TO ITS CURRENT SITE IN ZAGREB, WHICH EMPLOYS ABOUT 60 PEOPLE, TEN OF WHOM ARE TERTIARY QUALIFIED.
VLADIMIR PRELOG, PHD, NOBEL PRIZE WINNER FOR CHEMISTRY IN 1975, JOINS THE COMPANY AND BEGINS A RESEARCH ROLE IN KAŠTEL D.D.

KAŠTEL D.D. BECOMES ONE OF THE FIRST SULPHONAMIDE PRODUCERS IN THE WORLD. STREPTAZOL, PATENTED UNDER NUMBER 13726 AND LAUNCHED IN 1937 IN THE FORM OF TABLETS AND INJECTIONS, ACHIEVES GREAT SUCCESS.

PLIVA GETS ITS CURRENT NAME (THE STATE INSTITUTE FOR PRODUCTION OF MEDICINES AND VACCINES) AFTER 1945 PRODUCTION INCREASES, THE NUMBER OF EMPLOYEES INCREASES, AND THE CONTROL-ANALYTICAL SECTOR IS FOUNDED.

PLIVA BECOMES A MEMBER OF THE TEVA GROUP, THE WORLD’S LARGEST GENERIC PHARMACEUTICAL COMPANY.

OXYTETRACYCLINE AND VITAMIN B6 PRODUCTION STARTS.

THE PRODUCTION OF VITAMIN C, BASED ON IN-HOUSE PATENTED TECHNOLOGY, BEGINS.

THE NEW RESEARCH INSTITUTE OPENS.

PRODUCTION IN THE NEW FACILITY FOR ORAL SOLID FORMS STARTS.

NUMEROUS RECONSTRUCTION ACTIVITIES TAKE PLACE AT THE INJECTIONS AND CREAMS PRODUCTION FACILITIES.

THE NEW RESEARCH INSTITUTE OPENS.

PLIVA BECOMES A MEMBER OF THE TEVA GROUP, THE WORLD’S LARGEST GENERIC PHARMACEUTICAL COMPANY.

A NEW INVESTMENT CYCLE, ONE OF THE BIGGEST IN THE COMPANY’S HISTORY, BEGINS.

OVER THE NEXT SEVERAL YEARS, A NEW PRODUCTION FACILITY FOR ACTIVE PHARMACEUTICAL INGREDIENTS WILL BE BUILT AT PLIVA’S SITE IN SAVSKI MAROF. THE EXPANSION OF PRODUCTION CAPACITIES FOR ORAL SOLID FORMS AND INJECTIONS, AND THE INTRODUCTION OF NEW TECHNOLOGIES TO THE PRODUCTION AND PACKAGING OF FINISHED DOSAGE FORMS, GETS UNDERWAY AT THE ZAGREB SITE.
With more than 90 years of successful pharmaceutical operations, PLIVA is today the biggest pharmaceutical company in Croatia and one of the leading companies in Southeast Europe. With over 1,700 employees, PLIVA is also one of the biggest economic entities in Croatia and one of the country’s major exporters.

PLIVA’s operations comprise of the production of finished dosage forms and active pharmaceutical ingredients, commercial operations in Croatia and in the region and the research and development of generic medicines and active pharmaceutical ingredients.

Thanks to the approvals granted by the US Food and Drug Administration (FDA), the British Medicines and Healthcare Products Regulatory Agency (MHRA) and those by other relevant European agencies, PLIVA is one of the manufacturers complying with the high global quality standards required for international markets. Highly qualified and motivated employees are one of the strongest sources of PLIVA’s competitiveness. Created over a long period of time, PLIVA’s corporate culture reflects its values and is a key success factor for the achievement of strategic goals and a crucial prerequisite for timely adjustment to continuous changes.

PLIVA holds the leading position in the Croatian market in the prescription drugs segment: in 2011 almost two hundred molecules in over 290 dosage forms were included in the reimbursement list of the Croatian Health Insurance Institute, and PLIVA also plans to register further products.
A small team of enthusiasts, guided by their love for science, started with research and development activities soon after the foundation of Kaštel, PLIVA’s predecessor, in 1921. The first research projects, which resulted from cooperation with the University of Zagreb’s Prof. Vladimir Prelog, later a Nobel Prize Winner for chemistry, were organised in 1936. A team of hard-working researchers achieved outstanding scientific results in the field of sulphonamides and developed manufacturing procedures for a number of products.

From 1936 to World War Two many Kaštel employees, primarily chemical engineers, participated in research. To acquire expertise not only in synthesis, but also in the research of new compounds, they attended specialty training in Vienna and Paris. After their return to Kaštel, the science department, consisting of three laboratories, namely chemical, pharmacological and bacteriological, was founded.

Maintaining its R&D focus in the post-war period, PLIVA founded its own Research Institute in 1952, where it developed in-house laboratory and technological procedures for many pharmaceutical products. The production of second and third-generation sulphonamides started soon afterwards, and it was followed by the production of vitamin C, vitamin B6, and oxytetracycline, an antibiotic with biotechnology-based production, starting very shortly thereafter. The Institute also continued researching methacyclines, beta-lactam antibiotics and erythromycin derivatives and filed the first patent applications in this field. A syste-
mactic work effort on the development of various procedures and their transfer to production strengthened PLIVA’s position, which soon started to export its products to western markets, primarily the American market.

**THE FIRST INSTITUTE WAS OPENED IN 1952.**

All R&D teams and laboratories already supporting production were included in the newly-formed Research Institute in the fifties. The new institute had inorganic chemistry, organic chemistry, pharmacology, analytical (later physical), microbiology, chemical technology and pharmaceutical technology departments.

**Organic synthesis** was the backbone of the research work. Initially, the short-term programme was focused on the development of manufacturing procedures for already known medicines, while the long-term programme covered the synthesis of new bioactive compounds expected to exert favourable therapeutic effects. The researchers also worked on sulphonamides and CNS products, especially barbiturates. A number of bulk pharmaceuticals, such as spasmodytics, antihistamines, hypertones, diuretics and vitamin C, were introduced into production on the basis of procedures developed in-house.

The research and development of finished dosage forms, which includes the development of formulations, research associated with the introduction of new technologies and packaging materials, use of various analytical techniques, and product stability tests, naturally resulted from the research of active pharmaceutical ingredients. Almost all human medicines manufactured at PLIVA passed through these laboratories.

A lot of attention has consistently been dedicated to pharmacology, both for preclinical trials of new active pharmaceutical ingredients, including pharmacodynamics and pharmakokinetics, and for toxicology. This is especi-
ally true in reference to anti-infective, anti-inflammatory, immunomodulating and antidiabetic effects of the molecules and bioavailability of medicinal products.

Thanks to outstanding results and the valuable scientific achievements of PLIVA’s researchers, the company went through production eras that include sulphonamides, vitamins, semi-synthetic and beta-lactam antibiotics, each characterised by in-house developed procedures and patents and a high level of knowledge and experience.

**DISCOVERY OF AZITHROMYCIN**

The research of chemical transformations of tetracyclines and erithromycin, along with the synthesis of new azalides carried out in the seventies and the eighties, resulted in a patent application for azithromycin being filed in 1981. The credit for the discovery of the new antibiotic goes to a team of PLIVA’s scientists consisting of Gabrijela Kobrelj, Gorjana Radobolja-Lazarevski, Zrinka Tamburašev and Slobodan Đokić. Azithromycin is a broad-spectrum antibiotic with outstanding properties for the treatment of bacterial infections. The first semi-scale volumes of azithromycin were manufactured in 1986, the same year PLIVA signed the agreement with the U.S.-based company Pfizer on the joint development and commercialisation of the finished dosage form worldwide. The production of the finished dosage form, known as Sumamed, began in 1988, while its promotion on the US market, under the brand name Zithromax, began in 1991. Azithromycin later became the “gold standard” for macrolide antibiotics and the entire class was later named azalides.

Thanks to azithromycin, PLIVA has become a renowned company and one of the few companies worldwide to develop an antibiotic in-house. The American Chemical Society proclaimed PLIVA’s scientists Heroes of Chemistry 2000 for their discovery of azithromycin.
A great proportion of the credit for PLIVA’s achievements to date, and its current status, can be attributed to its in-house research and development programme. The information about development projects gathered on the global level and the optimal use of knowledge and equipment will support the achievement of business goals and strategy in the forthcoming years. Clearly defined new product development and project management processes, focusing on niche areas, the use of state-of-the-art technologies and scientific methods, and the systematic protection of intellectual property rights underpin PLIVA’s research and development strategy.

PLIVA’s organisational approach to research and development reflects the diversity and complexities of the pharmaceutical industry. There are two main branches of production in the company: the production of medicines in various finished dosage forms, such as tablets, capsules, syrups, creams, ointments and injections, and the production of active pharmaceutical ingredients. To support these two branches of production, PLIVA’s research and development activities are also organised in two branches.
RESEARCH AND DEVELOPMENT
OF GENERIC MEDICINES

The current R&D strategy is focused on the development of generic medicines, and Zagreb is one of the most important research centres and the centre of excellence in the Teva Group. The goal of the strategy is to develop new medicines by using various technologies based on scientific principles, while increasing the level of scientific expertise in the use of new product development procedures and in the introduction of new analytical techniques for the evaluation of these medicines.

More than 120 highly qualified employees use the highest quality and state-of-the-art equipment to address even the greatest challenges, and utilise their knowledge in the development of high-quality new products. PLIVA currently has over a hundred projects in different phases of development intended for the European Union, the USA, Croatia, Southeast Europe, Africa, Asia, Canada and Latin America. Products developed in Zagreb, depending on their dosage form and properties of the contained active pharmaceutical ingredients, are manufactured both in Zagreb and other Teva Group sites.

The development of generic medicines begins in PLIVA’s R&D laboratories. The purpose of developing any generic medicine is to obtain a high-quality, efficient, safe and stable product while respecting all regulatory and marketing requirements in target markets. This goal, however, cannot be attained without the close cooperation with almost all departments in PLIVA and a number of departments across Teva.
Staff in Research and Development work on the development of various dosage forms, i.e. solid, liquid and semi-solid forms, including various types of tablets and capsules, injections, infusions, solutions and suspensions, creams, gels and ointments. Any successful and complex development process will include formulation development (definition of qualitative and quantitative composition), as well as selection of the most appropriate manufacturing procedure and packaging material.

The development of a dosage form starts with comprehensive preformulation studies, which are based on the latest scientific principles for the characterisation of the active substance or the medicinal product. These studies represent the basis for formulation development – the choice of the appropriate quality and quantity of excipients to define the composition of the formulation, and the use of the most appropriate technology for dosage form manufacturing. Excipients can perform various functions (dissolution, suspension, thickening, dilution, emulsification, stabilisation, preservation, colouring, flavouring), all of which aid in transforming the active substance to an efficient and appropriate dosage form.

The choice of the appropriate technology for the incorporation of the active pharmaceutical ingredient into the dosage form is one of the key contributors to obtaining a high-quality product. The most appropriate technological procedure is selected in line with the characteristics of the active pharmaceutical ingredient and the specificities of the dosage form. Research and Development uses a number of conventional and recently-developed technologies for the development of finished dosage forms.
Technologies used in the development of solid dosage forms include both direct compression and wet and dry granulation. Wet granulation (high shear granulation and fluid bed granulation) is used for technologically demanding active pharmaceutical ingredients, as it enables the handling of powdery materials and their formulation into tablets and capsules.

Research and Development works with increasingly sensitive and technologically demanding active pharmaceutical ingredients. In such cases, they apply dry granulation (roller compaction and slugging), which comprises of material processing, however without any exposure to moisture or elevated temperatures in order to reduce any possibility of changes in the structure of the active pharmaceutical ingredient.

In addition to the production of technologically demanding powdery materials, granulation technologies are also used to modify dissolution in the manufacturing of very complex dosage forms with prolonged or modified release. Hot melt extrusion, a new technology in the field of research and development of generic medicines, is used for modifying dissolution.

For liquid dosage forms, i.e. oral and sterile solutions and suspensions, various technologies in preparation of suspensions and solutions are used. In addition to very complex aseptic procedures, sterilisation and freeze drying are used. The latter enables the formation of sensitive active substances into finished dosage forms for parenteral administration.

Sterile products with prolonged release and suspensions are a special challenge. A new technology, high pressure homogenisation, is used in their development.
Different homogenisation procedures, which enable suspension, dissolution or emulsification of one or more active substances in a very complex multi-component system, are used in the development of semi-solid forms, i.e. homogeneous gels, creams and ointments.

In addition to defining formulation and manufacturing technology, appropriate choice of packaging materials is required to achieve expected product quality, which should comply with API (sensitivity to moisture, light and oxygen) and finished dosage form properties. The packaging material also protects the product integrity during its warehousing, distribution and use.

An indispensable part of generic medicines development is the development of appropriate analytical methods. State-of-the-art analytical methods are used to monitor product development, which begins with the characterisation and choice of suitable active substances and excipients, and to monitor production and stability testing (carried out to define shelf life and storage conditions). Analytical methods used for monitoring product quality comprise of a number of analytical techniques, primarily in the field of chromatography and spectroscopy, as well as a number of physicochemical methods.

Keeping abreast of, and acquiring new, knowledge and technologies enables the introduction of new technologies in the production of APIs and finished dosage forms and compliance with global market requirements.
Computerised chromatographic systems and detectors and specific analytical techniques enable more knowledge of the composition of the medicinal product which, along with Quality by Design (QbD), ultimately produces a competitive product.

The knowledge and understanding of pharmacokinetic, pharmacodynamic, physicochemical and biopharmaceutical properties of APIs and excipients, as well as the knowledge of primary packaging units, is of crucial importance to the success of overall processes.

PLIVA’s scientists face the challenges of numerous manufacturing technologies on a daily basis. The new technologies for particle coating and masking of a bitter taste of active substances introduced last year, along with the development of microemulsion for cutaneous administration, represent milestones in our work.

**RESEARCH AND DEVELOPMENT OF ACTIVE PHARMACEUTICAL INGREDIENTS**

The team tasked with research and development of Active Pharmaceutical Ingredients currently works on about twenty projects in various phases. The main challenges are to strengthen the position of the excellence centre in the areas of complex synthetic routes, catalytic conversions, crystallisation and metastable solid state forms, analytical chemistry, and especially analysis of traces of organic and inorganic matter (traces of solvents, related compounds and different metals) and the development of processes based on computing procedures and statistical tools.
The goal is to shorten research and development phases and to upgrade processes for existing products in order to maintain their competitiveness within and outside of the Teva Group. These activities are carried out simultaneously with the continuous introduction of new knowledge and technologies, upgrading of scientific and professional expertise in organic synthesis, catalytic conversions and analytical chemistry, with an emphasis on specific analytical techniques and trace analysis, physical characterisation, discovery of new and research into existing solid state forms, development and scale-up of computer-aided processes, real-time data gathering, and improvement of current processes based on “green chemistry” and high safety standards.

The pharmaceutical industry has a very simple, yet very noble role: discover new medicines and make them accessible to as many people as possible in order to cure disease and improve the quality of life. Medicines that are prepared and delivered to patients for this purpose consist of many ingredients, including active ingredients, which form the backbone of the research and development in the pharmaceutical industry and at PLIVA as well. As the majority of active ingredients consist of organic molecules, their preparation, i.e. organic synthesis, is the basis for development of active pharmaceutical ingredients at PLIVA.

Since there are more than 50 million chemical compounds and thousands of chemical transformations, any chemical compound may be prepared in numerous different ways. The selection of molecules that
take part in the chemical reaction, and the means by which a compound is formed, is determined by means of synthesis. There is a number of ways to prepare an active ingredient, however few are appropriate for use in the pharmaceutical industry.

The selected synthetic route is improved and upgraded during its development thanks to the understanding of kinetic, thermodynamic and process aspects. It ultimately results in a process that can be carried out in a cost-efficient and environmentally acceptable way.

The development of any such process requires an interdisciplinary approach and engagement of experts in organic synthesis, chemical technology and analytical chemistry. The selected compounds should be those compounds whose multi-level chemical transformation yields a desired active substance, with as few related compounds as possible. The analysis and choice of chemical transformations is also very important in order to use minimum energy and achieve maximum yield.

In this phase of research and development, experiments are carried out on a milligram or gram scale, with virtual projection of process feasibility on the industrial scale, often in tonnes. The use of various homogeneous and heterogeneous catalysts, i.e. substances which maximise yield and minimise the number of related substances in chemical transformations, has a significant process impact. Aware of its numerous advantages, PLIVA devotes a lot of attention to this area. To date, catalytic conversion has been applied to several products in production plants. This enables the
catalysis investigated in smaller-scale laboratory development to be successfully used in production.

In addition to synthesis of active pharmaceutical ingredients, their physicochemical properties are also very important. The majority of compounds are isolated in the form of crystals or undefined (amorphous) solid state compounds by crystallisation or precipitation. Solid state properties resulting from the proper internal structure (crystals) or the absence of such structure should be thoroughly investigated. Once data are collected and the relationship between the structure and properties established, there are a number of opportunities to make target changes.

Changes can be controlled and directed throughout the crystallisation process. Therefore, the understanding of both theoretical and practical aspects of crystallisation is indispensable. Once the active substance is isolated by crystallisation, it is additionally analysed with the intent of determining the form and size of crystals. The purpose of these efforts is to design a procedure which will yield crystals of identical form and size.

In the case of big crystals, they can be reduced by various milling or micronisation procedures. If the active substance is sparingly soluble, its dissolution rate may be increased by reducing particle size and this may have an influence on the properties of the medicinal product.

Quality assurance and appropriately directed chemical processes require excellence in the development and use of analytical methods, which enable the mo-
nitoring and control of reagents, products of parallel reactions and disintegration by-products.

The requirements are as stringent as necessary to control the composition to the 1 to 10 000 level, or in some cases even to the 1 to 1 000 000 level. This means that all compounds which may be produced during the process of preparation, or those that are the by-products of disintegration, should be known.

Quite often there are more than twenty compounds that require analysis, and some of them should be controlled during the preparation process as their levels have a direct impact on the properties of the obtained product. A number of analytical techniques from the field of chromatography, along with various spectroscopic techniques and procedures for determination of molecular structure and physical values, should be used.

One can say that the majority of the new instruments which are used in other industries are there thanks to the pharmaceutical industry. Therefore, instrument and equipment manufacturers cooperate with PLIVA’s researchers and are glad to provide their products for testing at PLIVA. All relevant parameters analysed during process development should be confirmed in the final research phases.

Critical parameters are selected out of a great number of parameters (several tens of parameters may be tested). These parameters, i.e. their variability, have the greatest impact on the quality of the manufactured active substance.
Process parameters should be selected to enable the performance of industrial scale processes. The treatment and recycling of process substances is also important. The purpose is to use an industrial-scale process harmonised with green chemistry principles.

In this phase of research and development, a check should be performed to confirm that the experimental space has been fully investigated. Statistical planning and other mathematical modelling methods are used in this phase.

Scientists and other experts working in pilot plants of research and development are involved in this phase thereby achieving the synergy of chemical engineering and organic and analytical chemistry, as well as the understanding of material properties thanks to the use of various physicochemical methods and procedures. Initially, when active pharmaceutical ingredients are prepared on a milligram scale, researchers create their vision of a future process on the tonne scale. In this phase of the research, the approach is quite the opposite, i.e. the ingredients are prepared in kilograms (sometimes several hundred kilograms in one trial) and attempts are made to create links with the substance properties on a molecular level. Regardless of the scale of chemical transformation or synthesis of the substance, one should always keep in mind the properties of the molecules which contribute to the process. Of course, each research segment requires a different approach and success factors could be different or even contradictory.

This is what creates the beauty and challenges of the
PLIVA AND THE CROATIAN SCIENTIFIC COMMUNITY

PLIVA’s experts and scientists contribute to the work of the Croatian scientific community by attending and organising scientific and professional symposia, participating in the work of professional societies and associations and through significant publishing efforts. They also co-organise lectures or teach at universities as guest professors or are mentors to students whose research for their bachelor or doctoral theses also includes work in PLIVA’s laboratories. About twenty students from the University of Zagreb do their practical training in the field of research and development of active pharmaceutical ingredients and medicinal products in PLIVA’s research laboratories.

Tailored visiting programmes are also organised for numerous groups of school and university students, who are welcome to visit PLIVA and learn about the challenges and benefits of working in the pharmaceutical industry.
The Award for Organic Chemistry “Dr. Vladimir Prelog”
As homage to Dr. Vladimir Prelog, Nobel Prize Laureate, PLIVA and the Croatian Chemical Society established the Dr. Vladimir Prelog Award for Organic Chemistry in 1996.

The award has been presented since then as an incentive to junior Croatian scientists for their scientific work in the field of organic chemistry. The 90th anniversary of the birth of this Nobel Prize Winner and the leading figure of the Croatian science directly influenced the establishment of this award. Furthermore, this is one more way in which PLIVA confirms its commitment to scientific excellence and its support of young scientists in the Republic of Croatia.

R&D Days
PLIVA’s R&D Days have traditionally been held once a year. They are an opportunity for PLIVA’s researchers to present all their achievements, as well as challenges they encounter in everyday work. Organised as a symposium, where all results can be presented and discussed, they represent a unique means of sharing knowledge and experiences. Often, attendants at different conferences and congresses do not get any information related to intellectual property of presenters.

This is not the case with PLIVA’s R&D Days, where researchers can obtain all relevant details and thus complete their picture of a problem and potential solutions. There is no better way to learn than from colleagues from PLIVA who are ready to share their knowledge of the latest scientific achievements and technologies.
Researchers and other experts are of utmost importance for the achievement of success in very demanding and complex R&D activities carried out in PLIVA’s Research and Development. The synergies resulting from different professional backgrounds enable the creation of interdisciplinary teams whose different approaches to the same problem yield solutions to even the most complex problems. Their work has resulted in more than a hundred molecules and several hundreds of products in the market.

PLIVA has always treasured and encouraged openness and cooperation among various teams in the company. By joining the Teva Group, PLIVA’s researchers have been given new opportunities to expand international and multicultural co-operation and to learn and advance professionally thanks to the experience and knowledge of researchers from different countries.

In addition to the exchange of knowledge, there are always opportunities available to use various types of scientific equipment. This environment also creates opportunities and facilitates the use of new technologies. The mobility of technology and instruments is part of everyday work, and new knowledge and solutions in pharmaceutical production are acquired very quickly.

Cooperation with scientists and experts from scientific institutions in the country and abroad is an important link in the implementation of new knowledge and technologies and in establishing connections between the industry and the scientific community. Here we would like to mention PLIVA’s cooperation with the University of Zagreb, the Ruđer Bošković Institute, the Institute of Physics, the Slovenian National Chemical Institute and the Faculty of Pharmacy, the Max Planck Institute, the University of Cambridge, the University of Jerusalem and the University of Athens.

WORK IN MULTINATIONAL AND MULTICULTURAL TEAMS