Preface and Acknowledgments

This comprehensive collection of photographs of various living cells and cell lines cultured *in vitro* represents the first of its kind.

Within the last decades the use of cells in culture has not only increased dramatically in basic research but also expanded into many industrial processes and techniques, for example, for the generation of antibodies and biopharmaceuticals.

In industrial processes, the cells used are tested thoroughly with the aid of many and diverse direct and indirect analytical methods. As such sophisticated and time consuming testing is not always possible in basic research laboratories, a fast first control check for their viability under the microscope would be done and no other control seemed to be necessary in the past and even in the present.

This cell culturing in T-flasks, in Petri-dishes or in multiwell-plates is a technique that can be deduced since more than 100 years without great improvements if you look just for the behavior of the seeded cells on the substratum and their image under the microscope: Either they are attached after one or two days (as normal cells derived from a body's tissue do) or they keep rounded up in suspension like blood cells do. Dying or dead cells do not attach to the substrate and they keep rounded up or even disintegrate into small-vesiculated membrane particles.

For many years the cell morphology was the main and nearly only characteristic for the viable cells in culture, taking advntage of the invention of the phase contrast microscopy in the 1930s. This kind of microscopy was almost the only technique for the observation of live cells in greater magnification and therefore indispensable for people who worked with cells in culture.

But even now, although modern analytic methods at the cell's molecular level are in use after the rapid developments within the last 30 years to look into cells, light microscopy is still the most important tool in the routine field for viewing cells in culture.

Working with live cells and cell lines and observing them as vital organisms still means using an inverted phase contrast microscope to control continuously not only the morphology but at the same time the proliferation of a cell under culture condition in the T-flask. Each cell type and each cell line has its own morphological features even though cells originating from the same tissue may differ from each other.

Although many photographs of cells and cell lines exist and various pictures from respective cell lines can be found, for example, in the World Wide Web, it may be a tedious and time consuming task to find them at the various websites and/or in numerous journals and other publications. In addition, the morphology of cultured cells varies from the onset of seeding until

they become confluent and also from passage to passage. Density of cells causes striking changes of the morphology *in vitro* due to the availability of the substratum and their overgrowth. It is therefore very important to have a comparison of different densities of cultured cells in the flasks.

On the other hand, it must be emphasized that variations of the cell morphology during cultivation may derived from the use of different media, from the incubation conditions (seeding concentrations, CO_2-concentrations, humidity, and temperature in the incubator, length of incubation time) and from the individual (!) treatment during passages and from laboratory to laboratory. Therefore, our pictures taken from the T-flaks at different times were made under certain and defined condition (media, temperature and CO_2-concentration in the incubator, etc.) and these conditions are depicted within the text sides opposite to the pictures.

Our aim is to give a first impression of the individual cultivated cell line, but it must be emphasized again that our pictures of the cell morphology are derived from individual laboratory personnel. But nevertheless they may be representative for the respective cell line.

In our opinion, no 100% ideal picture of the respective cell exists. Our aim was to give an impression of an image of the cultured cells which comes closer to the truth than any other picture which may be found, for example, in the World Wide Web.

We want to introduce for the first time a comprehensive but limited number of living cell lines the photographs of which were taken during cultivation of the cells. This atlas may lead to a better control how these cultured cell lines may look alike under good cell culture practice (**GCCP**).

Our selection was certainly to some extent random. We could not introduce nearly all of the estimated 3500–4000 (?) cell lines listed in all scientific publications or in the catalogues of the cell banks. Our choice was to list the most used or most "popular" cell lines but certainly our choice may not find the consent of all people working with cell cultures. Proposals for introducing further cell lines are welcome.

Furthermore, it was not our aim to make "star pictures" for the "haute couture" of cells in culture, instead we made photographs under routine culture conditions with a "normal" microscopic equipment such as an inverted microscope equipped with a digital camera and a pdf-conversion program in the computer and/or printer. It was also not the aim to give pictures of contaminated or of sick cells in culture in all details. People, who had these kinds of problems may look further in the textbooks of cell and tissue culture.

Instead we recommend in the context of all cell culture practices to withdraw contaminated cell cultures immediately and not try to cure them with antibiotics.

In Chapter 2, the most basic cell culture techniques are described. For further reading we refer to very detailed and informative cell culture manuals such as "*Culture of Animal cells*" by R. Ian Freshney (6th ed. Wiley-Blackwell New York, 2010) or "*Zell- und Gewebekultur*" by Toni Lindl and G. Gstraunthaler (6th ed. Spektrum Verlag Heidelberg, 2008). Chapter 3 contains the list of all cell lines. Chapter 4 is divided into three subchapters, namely human cell lines originating from various tissues and animal cell lines originating from various animals and from various tissues. Also included are primary cells of human origin that are characterized by a finite life span. The photographs of the primary cells are courtesy of PromoCell GmbH, Heidelberg, Germany. We thank Dr. Hüttner for providing these highly informative photographs of these cells.

STR-analyses were performed using the cell lines of CLS Cell Lines Service GmbH in Eppelheim and are consistent with STR data published by ATCC (if available). All cell lines are listed alphabetically, and the search for one particular cell line should be an easy task. Each cell line comes with a short description and some basic information.

The authors would like to acknowledge Jessica Hirscher who has been busy with culturing the cell lines; Dagmar Lojewski for spending many hours to take the photographs and to arrange the best photographs at differing magnifications; Ute Fischer and Dott. Francesca Maggi Herbring for controlling the contamination status of the cell lines.

Eppelheim and Munich, April 2013

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