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**Publisher** Distribution and © by:  
EAWAG, P.O. Box 611, CH-8600 Dübendorf  
Phone +41-1-823 55 11  
Fax +41-1-823 53 75  
<http://www.eawag.ch>

**Editor** Martina Bauchrowitz, EAWAG

**Translations** Norbert Swoboda, USA

**Linguistic revision** Patricia Colberg, USA;  
Helen Brügger-Clarke, Zurich

**Figures** Yvonne Lehnhard, EAWAG; Peter Nadler,  
Küsnacht

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**Publication** Three times yearly in English, German and  
French. Chinese edition in cooperation with INFOTERRA  
China National Focal Point.

**Cover Photos** EAWAG

**Design** inform, 8005 Zurich

**Layout** Peter Nadler, 8700 Küsnacht

**Printed** on original recycled paper

**Subscriptions and changes of address** New sub-  
scribers are welcome! Please find the order form in the  
middle of this issue.

# From ecosystem via molecule to ecosystem



Rik Eggen, head of the  
department "Environmental  
Microbiology and Molecular  
Ecotoxicology"

Molecular biology nowadays plays a vital role in many fields of scientific research. In medicine, for example, pathogenic processes are studied on a molecular level. Subsequent to the identification of the underlying mechanisms, it becomes possible to develop specific drugs. These are either applied as preventive medicine, such as vaccination, or – once the disease has broken out – are used as a cure, acting specifically and with as few side effects as possible. Less known, however, is the fact that molecular approaches are also becoming more and more important in environmental research, too.

The EAWAG is committed to the sustainable use of aquatic ecosystems – rivers, lakes and groundwater. Aquatic ecosystems are very complex and offer habitats for a diversity of living creatures, from single cellular bacteria or algae to multicellular higher plants and animals. The organisms live in permanent interaction with each other and with their environment, which in itself is very dynamic and subject to continuous change. Just think of natural changes such as daily and seasonal fluctuations as an example. Adding to these natural changes are anthropogenic impacts which are continuously increasing due to the steadily growing world population. Problems such as the input of pollutants into aquatic ecosystems, the growing pressure on freshwater resources and the increase of pathogens in surface waters of developing countries can no longer be neglected. There is a need for concepts and approaches which allow the protection of the complex aquatic environment for the future by preventive methods and make it equally possible to deal with acute problems directly and "without side effects". Therefore, the EAWAG is attempt-

ing to analyze processes in ecosystems on a molecular level, in order to better understand, predict and prevent the effects of anthropogenic impacts. In this work, we are well aware that important insights for the ecosystem can only be obtained if we do not lose the view of the whole picture of the ecosystem.

To study processes on molecular level, it is essential to perform basic molecular research. The EAWAG is studying such different aspects as the genetic diversity of *Daphnia* in alpine lakes and the mechanisms of action of pollutants on a molecular level. Furthermore, applied science plays an important role at the EAWAG. Here as well, molecular approaches and methods are used more and more. Examples from this field are the development of biosensors for the detection of pollutants, the identification of a bacterium now being used for the removal of nitrogen in wastewater treatment plants and the development of a molecular method for the detection of pathogens in drinking water.

I invite you to enter the world of the molecules and hopefully become convinced that molecular biology offers an essential contribution to the sustainable management of aquatic ecosystems.

