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Veterinarians, academia and industry: shaping the future of veterinary sciences

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Financing research in universities - where does the money come from?

Many universities, and their constituent faculties, are under increasing pressure to re-evaluate the way in which they finance their research projects. Traditionally, most research at universities has been funded through competitive grants involving relatively small amounts of money. To attain these grants, individual researchers have to submit applications in which they provide exhaustive details of specific and well-defined projects. Most, but not all, applications are peer reviewed, with the aim that only good quality research is funded. This system certainly has its advantages when it operates against a background of abundant financing and a sympathetic public that has a positive attitude towards research. The United States is fortunate enough to be in this situation. Europe, on the other hand, is not. Most European countries have experienced serious cutbacks in government funding for research. In addition, the public has developed a growing distrust of scientists, and in the wake of crises, such as BSE, they want to know: "Why didn't the scientists do something about this earlier?" Despite this attitude when things are going wrong, there is little will to spend the sums of money needed to carry out good basic research in advance of such events occurring.

Clearly new sources for funding need to be explored. Larger sums of money need to be channelled into university research. This money is needed to improve and replace the universities' often crumbling infrastructure and to finance salaries and experimental costs at more realistic levels than have previously been possible. The latter objective is particularly important if well-qualified personnel are to be attracted into, or to remain in, research.

A new partnership - academia and industry

Industry provides one potential source of funding for research in universities. Although it has already been a traditional source of income for academia, its contributions have been relatively small and dedicated to specific projects that often last only two or three years. For a more substantial impact on academia, universities need to encourage industry to contribute larger-scale and longer-term financing schemes, which should be made available to a wider range of projects.

If universities are to be taken seriously by industry, however, they must negotiate from a position of strength. A severe lack of funds automatically puts them in a weak bargaining position, and from here they will remain happy to take what crumbs fall from industry's table. Under these circumstances universities are vulnerable to exploitation by the "big bad wolf" - Industry. Universities do, however, have one valuable asset - human resources. Young scientists are trained to have a discovery-driven research ethos. Companies desperately need to fill their product pipelines with the new ideas that arise from this type of research. There is no doubt that product development is carried out best by industry, in-house. However, discovery-based research is costly and requires a certain level of skill and freedom of mind, and this is often difficult to accommodate in the more structured environment found in commercial companies.

By defining new, larger-scale and longer-term finance models, a mutually beneficial partnership may develop between academia (the purveyor of quality, discovery-based research) and industry (the developer of commercial products from research discoveries). Ideally, there should be a flow of

resources from university to industry, and back again. For such a strategy to function, however, both partners must meet on equal terms. Industry must understand the needs and motivations of academia and its members, i.e. the pursuit of research, the publication of research findings, the training of scientists, and the teaching of undergraduates. And universities must understand the needs of industry, i.e. product protection by patents, the development of ideas, the feasibility of projects, the profits from marketing and added shareholder value. If these objectives are met it should be possible to cycle the fruits of discovery-based research from academia to industry, and to return a proportion of the generated wealth to the universities (Figure 1).

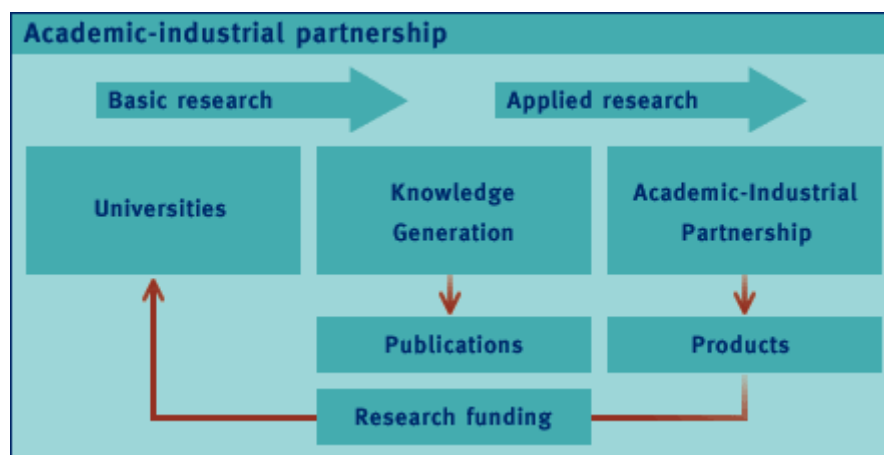



Figure 1. A flow diagram illustrates how an academic-industrial partnership may be mutually beneficial to the two partners. Knowledge, generated by academia, is transferred to industry; industry translates knowledge into products and profit, which in turn provides academia with funding for research. As long as this flow is maintained, both partners should continue to profit.

Goal-oriented as opposed to serendipitous research needs to be balanced, however. It is well recognised that some of the greatest discoveries have been accidental, and if the academic freedom to pursue interesting lines of investigation is curtailed in any way, universities will cease to be places of discovery. On the other hand, if industry is to have any hope of extracting meaningful results from the research projects, they must have some structure with goals in mind. A company wishing to produce health care products will not benefit from research on photosynthesis, which its collaborating laboratory has decided to pursue because it was an interesting avenue that happened to open up. In practice, of course, changes in the direction of research are seldom so crass. A laboratory that has been chosen by a company because its research is of potential use to their development plans is highly unlikely to change radically its direction of research, at least not in the foreseeable future.

It would, nevertheless, be wrong of industry to insist on too much goal-oriented research from university laboratories. Scientists must feel comfortable with their work; they need freedom for intellectual thought, possible only with sufficient financial and temporal resources, which allows them to pursue research that may be secondary to their original objective. And you never know - a sidetrack may yield more valuable results than the original goal. But scientists must also fulfil their obligations in the partnership by completing the project they have agreed to do. Ideally a compromise between goal-orientated and serendipitous research should be sought and agreed upon. An attempt by both partners to understand the other will ultimately dictate the success or failure of university-industry collaborations.

Veterinary schools - the ideal partner for industry

Veterinary faculties are ideal research institutes to participate in such collaborations, particularly for projects related to health care products. The veterinarian receives a broad-based training which encompasses the biology and physiology of many species; in some universities veterinary students are



even taught elements of human biology. Most importantly their education covers all aspects of animal health and welfare, experimental design and statistics, and it is comparative. Also, since the 1980s there have been an increasing number of veterinary faculties that have introduced subjects like molecular biology into their syllabus.

Clearly, the veterinarian is an ideal candidate to play a key role in human and animal health care research. Therefore, if veterinary schools are considering entering into a partnership with industry, they should not overlook the fact that by far the largest market for the pharmaceutical industry is the development of human drugs. The principles behind health care product development for man can be applied equally well to the much smaller veterinary market, and who better to be involved in this than the veterinarian with an education founded in comparative biology?

Most health care research starts at the single cell level and biologists and biochemists are clearly best qualified for such activities. Very soon the results, or products, from this research must be tested at the multi-cellular level, often *in vivo* using animal models. Here the veterinary scientist has an advantage over the biologist and biochemist. Mice and rats are often the first choice of animal model for such experiments and the veterinarians' superior knowledge and understanding of an animal's physiology makes them the most suitable scientists for these comparative studies.

Accordingly, veterinary schools are beginning to change their traditional role in association with animal care and are embracing the concept of public health. The phrase "stable-to-table" clearly suggests that the veterinarian's role is to safeguard the health of man through the good health of animals. With this in mind, medical (i.e. human) and veterinary biomedical research should be considered together and not as separate subjects. Another new trend in many of the veterinary research and teaching establishments is the opportunity for students to specialise in small or large animal practice, food and public health or biomedicine and biotechnology, which will also open the way for collaborations with industry.

A successful partnership between academia and industry

Over the past four and a half years, the University of Veterinary Sciences in Vienna has collaborated with industry, initiated by a need to look for alternative sources of funding for research. Traditional sources were becoming increasingly limited, especially in Austria, and the European Union was starting to support research with a strong industrial participation. The existence of excellent laboratory facilities on the university campus helped the [Institute of Virology](#) to form the collaboration, initially for three and a half years, with a small Danish-German biotech company, [Bavarian-Nordic](#). The aim of the project was to develop cellular therapies for the treatment of pancreatic and breast cancer. The hallmarks that led to the highly successful collaboration were:

- A clear understanding of the other party's needs
- The accommodation of goal and discovery-orientated research
- Realistic and generous financial support for the Institute of Virology
- Patenting and commercialisation rights for the company
- No restrictions on publishing research results after fast track patent application.

The initial collaboration with [Bavarian-Nordic](#) was so successful that in July last year (2000) a new spin-off company was launched, called [Austrian-Nordic](#). Research is now concentrated on the further development of retroviral technologies for the treatment of solid tumours in man and animals. Factors contributing to this continued success are summarised in Figure 2.



Figure 2. A summary of factors that have contributed to the establishment of a new company, Austrian-Nordic, after a highly successful partnership between The Institute of Virology, at Vienna's University of Veterinary Sciences, and Bavarian-Nordic, a Danish-German biotech company.

Is this the future, then, of molecular virology in veterinary sciences? It is certainly not the whole story. Veterinary scientists will continue to play an important role in the monitoring of viral infections in animals and man. Increasingly, however, conventional descriptive virology, which can only hope to scratch at the surface of what there is to know about a given virus, must give way to the more in-depth mechanistic approach to the subject in order to understand how a particular virus, or group of viruses, really works. Such in depth knowledge and understanding will lead to its exploitation for the benefit of animal and human health, which brings us back to the question of whether we can successfully combine our knowledge with the resources of a biotech company, and so make practical use of our research findings. Biomedical research will become an increasingly important part of our future as veterinary scientists, and to finance and market these activities we must start thinking about working together with industry.

It is fitting to conclude this editorial with four simple rules for veterinary institutions to follow if they wish to have a successful future in research:

1. Do not be afraid to collaborate with industry
2. Negotiate the terms of the collaboration from a position of strength - universities hold unique knowledge that industry needs
3. Ensure that industry understands the scientists' need for academic freedom in their research and for the freedom to publish their findings
4. Do not forget to understand industry's needs

If we live by these four rules I foresee a golden future for veterinary science.