II. Background

A. Pharmaceutical Industry – The Development of a New Drug.

The development of a new drug currently takes an estimated 10-12 years, but this time has risen significantly over the past 40 years (by the end of the 1960's it took only around 8 years)[8]. The increase in development time is linked to several determining factors, namely the increased regulatory requirements, resulting for example in the need for a higher number of participants in clinical trials and longer trials.[9] An additional factor is the nature of the diseases under study, where a shift towards the treatment of certain chronic conditions can be observed. Since treatment in such cases is over a prolonged period of time (or even lifelong), the duration of the clinical trials necessarily extends to be able to forecast (or in the best case to exclude) side-effects during a chronic therapy.[10] High failure rates of clinical trials have been bringing the current estimated average cost of researching and developing a new drug to about 1 billion €.[11] Since the chance of a chemical entity becoming a marketable drug is about 1 in 10000 and for every successful project there might be at least 9 unsuccessful projects (investigational drugs)[12] which however also need to be financed, it is evident that a launched medicine needs to generate a continuous and substantial revenue to finance the development of fu-

8 M. Dickson, J.P. Gagnon, *The Cost of New Drug Discovery and Development*, http://www.discoverymedicine.com/Michael-Dickson/2009/06/20/the-cost-of-new-drug-discovery-and-development/ (last visited Jul 30, 2012).

9 *Id.*

10 *Id*.

11 EFPIA *supra* note 1 at 6.

12 Tudor I. Oprea, Current trends in lead discovery: *Are we looking for the appropriate properties?* 16 J. Comp. Mol. Des. 325, (2002).

ture drugs. Or as Jacob LJ put it in very clear words: "The few winners must pay for all the losers."[13]

Such investments are however nearly entirely borne by the originator companies from their own resources which makes it clear that a significant and sustained income needs to be generated to be able to maintain a position in this research intensive area of industry. To facilitate the understanding of the aforementioned research process, the following illustrative scheme should be considered:

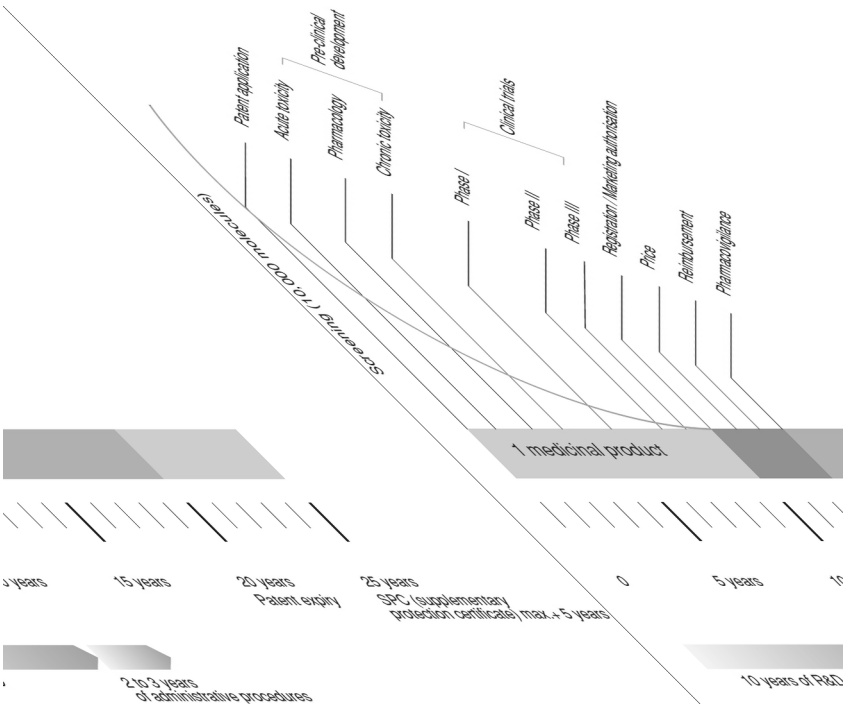

Figure 1: Phases of the Research and Development Process[14]

13 Sir R. Jacob, *Patents and Pharmaceuticals – a speech given on 28th November 2008 at the presentation of the Directorate-General of Competition's Preliminary Report of the Pharma-sector inquiry*, found at http://ec.europa.eu/competition/sectors/pharmaceuticals/inquiry/jacob.pdf, at 4, lines 21-22 (last visited Aug 2, 2012).

14 EFPIA *supra* note 1 at 7.

The different stages of the process exhibited in figure 1 show the registration of a patent application regarding certain chemical entities at a time 0 and the market authorization at ca. 10 years. At this point it should not be left out of sight, that the filing of a patent application is preceded by a time of basic research directed towards the identification of a suitable biological target for a given disease followed by the identification and first round of optimization of chemical compounds which are suitable for the purpose (e.g. inhibiting a metabolism, a viral action, bacterial growth etc.). This time may conservatively be estimated to range from 1 to 3 years, depending on the complexity and the novelty of the biological target.[15] During the phase of preclinical development, several of such optimization cycles are usually being run through until candidate compounds which are suitable for Phase I clinical trials are available. While the expenditures of the Preclinical Phase may already be significant (depending on the disease models available, some viral diseases can for example only be studied in primates), the clinical phases do exceed them several times. As part of the preclinical development of a drug candidate, toxicology and safety studies as well as studies regarding suitable pharmaceutical formulations and the stability are being carried out. Many compounds fail already in this stage, as they might have a desirable activity profile, but turn out to be also toxic. While an early understanding of the interactions with other drugs is desirable, such studies are oftentimes not being carried out before the completion of Phase I clinical trials.[16]

B. New Drug Approval Regulations

The European system offers three routes for the authorisation of medicinal products, the so-called centralized procedure[17] using the

15 Authors own experience from drug research in various pharmaceutical companies.

16 EMA, *Guideline on the Investigation of Drug Interaction*, (Apr. 22, 2010) http://www.emea.europa.eu/docs/en_GB/document_library/Scientific_guideline/2010/05/WC500090112.pdf, at 7 (last visited Aug 2, 2012).

17 Regulation (EC) 726/2004, 2004, O.J. (L 136) 1.