



Pharmine

Integration of the industry/research component in pharmaceutical education

EAFP, Utrecht, 2012

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Plan of the talk.

- PHARMINE (“PHARmacy education IN Europe”)
- 2005/36/EC and 2001/83/EC and organisation of European pharmacy education
- “Medical” or “chemical” orientation of courses
- Pharmaceutical technology
- Masters in industrial pharmacy



PHARMINE delegates (n=31+12)

<u>Austria</u>	C. Noe, Vienna	<u>Malta</u>	L. Azzopardi, Msida
<u>Belgium</u>	B. Rombaut, Brussels	<u>Moldova</u>	V. Boldescu, Chisinau
<u>Bulgaria</u>	V. Petkova, Sofia	<u>Norway</u>	K. M. Ulshagen, Oslo
<u>Czech Republic</u>	M. Polasek, Prague	<u>Poland</u>	S. Polak, Krakow
<u>Denmark</u>	U. Madsen, Copenhagen; M. Brandl, Odense	<u>Portugal</u>	J. A. G. Morais, Lisbon
<u>Estonia</u>	P. Veski, D. Volmer, Tartu	<u>Romania</u>	C. Mircioiu, Bucarest
<u>Finland</u>	J. Hirvonen, Helsinki	<u>Serbia</u>	V. Kuntic, Belgrade
<u>France</u>	A. Marcincal, Lille	<u>Slovakia</u>	J. Kyselovic, Bratislava
<u>Germany</u>	R. Süss, Freiburg	<u>Slovenia</u>	B. Rozic, Ljubljana
<u>Greece</u>	M. Rekkas, Athens; K. Poulas, Patras	<u>Spain</u>	B. Del Castillo-Garcia, Madrid; L. Recalde-Manrique, Granada
<u>Hungary</u>	G. Soos, Szeged	<u>Sweden</u>	R. Hansson, Uppsala
<u>Iceland</u>	T. Kristmundsdottir, Reykjavik	<u>The Netherlands</u>	T. Schalekamp, Utrecht, H. Haisma, Groningen
<u>Ireland</u>	J. Strawbridge, Dublin	<u>Turkey</u>	F. Hincal, Ankara
<u>Italy</u>	C. Rossi, Perugia	<u>UK</u>	K. A. Wilson, Aston; G.B. Lockwood, Manchester
<u>Latvia</u>	R. Muceniece, B. Maurina, Riga	Incomplete data from: Albania, Armenia, Azerbaijan, Bosnia-Herzegovina, Croatia, Georgia, Kazakhstan, Kosovo, Montenegro, Russia, Switzerland, Ukraine. No pharmacy faculties: Andorra, Cyprus, Holy See, Luxembourg	
<u>Lithuania</u>	V. Briedis, Kaunas		
<u>Macedonia</u>	A. Dimovski, Skopje		



The PHARMINE WP7 survey



PHARMINE
Pharmacy Education
in Europe

***The PHARMINE survey of European higher education institutions
delivering pharmacy education & training***

V1

***If you encounter any problems when filling out this form please contact the leader of PHARMINE work program WP7:
jeffrey.atkinson@orange.fr***

PHARMINE

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Executive Director: Jeff Atkinson, Pharmacolor Consultants Nancy, Villers, France. jeffrey.atkinson@orange.fr

With the support of the Lifelong Learning Programme of the European Union (142078-LLP-1-2008-BE-ERASMUS-ECDSP).

Website: www.pharmine.org



ANNEX 1. Directive 2005/36/EC of the European Parliament and of the Council of the 7th September 2005 on the recognition of professional qualifications (Official Journal of the European Union, 30/9/2005, L255/22)

Section 7 Pharmacist

Article 44 Training as a pharmacist

1. Admission to a course of training as a pharmacist shall be contingent upon possession of a diploma or certificate giving access, in a Member State, to the studies in question, at universities or higher institutes of a level recognised as equivalent.
2. Evidence of formal qualifications as a pharmacist shall attest to training of **at least five years' duration**, including at least:
 - (a) four years of full-time theoretical and practical training at a university or at a higher institute of a level recognised as equivalent, or under the supervision of a university;
 - (b) **six-month traineeship** in a pharmacy which is open to the public or in a hospital, under the supervision of that hospital's pharmaceutical department.

That training cycle shall include at least the **programme described in Annex V**, point 5.6.1. The contents listed



**DIRECTIVE 2001/83/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 6 November 2001
on the Community code relating to medicinal products for human use**

Article 41

In order to obtain the manufacturing authorization, the applicant shall meet at least the following requirements:

- (a) specify the medicinal products and pharmaceutical forms which are to be manufactured or imported and also the place where they are to be manufactured and/or controlled;
- (b) have at his disposal, for the manufacture or import of the above, suitable and sufficient premises, technical equipment and control facilities complying with the legal requirements which the Member State concerned lays down as regards both manufacture and control and the storage of medicinal products, in accordance with Article 20;
- (c) have at his disposal the services of at least one qualified person within the meaning of Article 48.



Subjects EC directive 2005 “**pharmacist**”

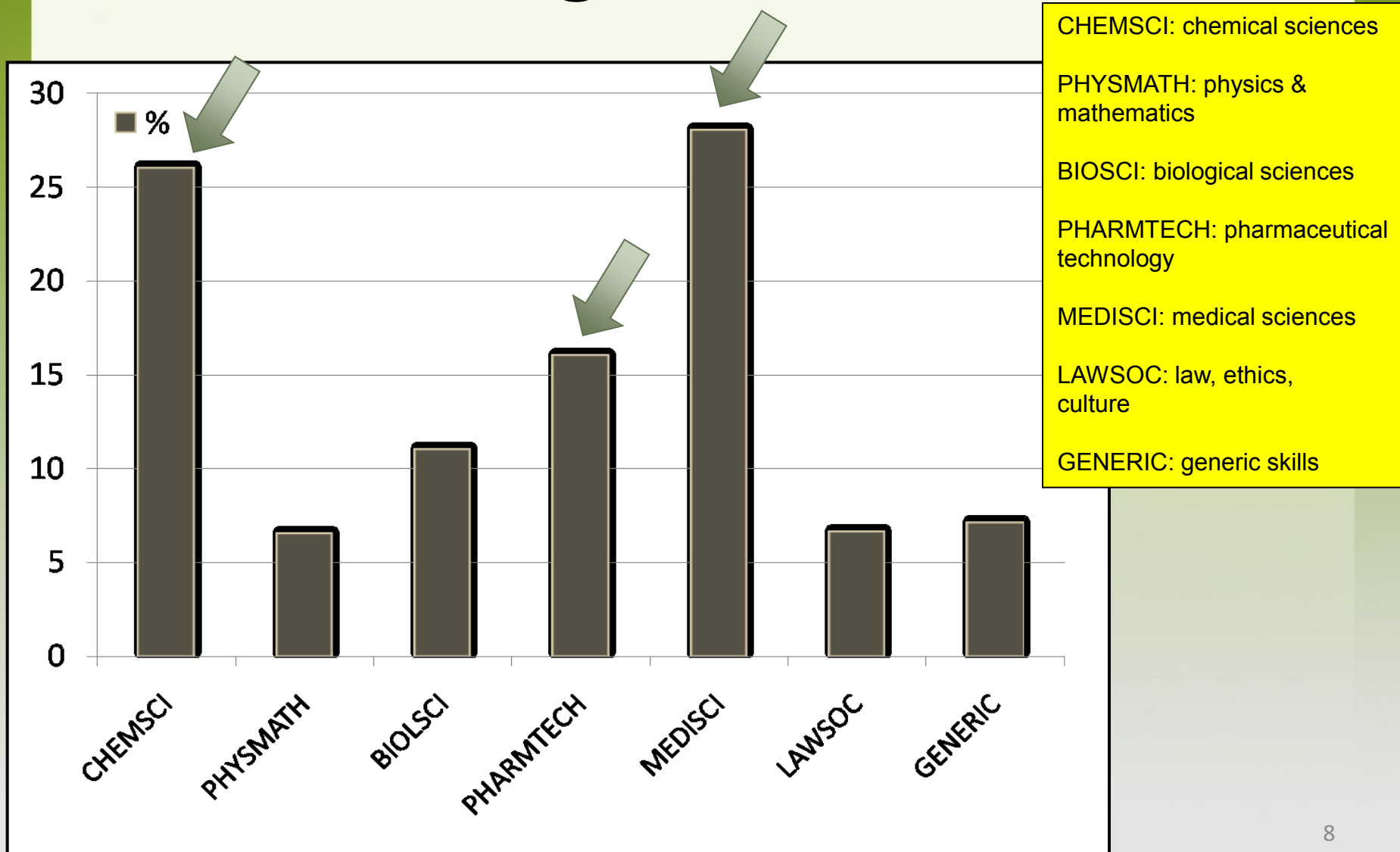
- Plant and animal biology
- Physics
- General and inorganic chemistry
- Organic chemistry
- Analytical chemistry
- Pharmaceutical chemistry, including analysis of medicinal products
- General and applied biochemistry (medical)
- Anatomy and physiology; medical terminology
- Microbiology
- Pharmacology and pharmacotherapy
- Pharmaceutical technology
- Toxicology
- Pharmacognosy
- Legislation and, where appropriate, professional ethics.

2001 “**qualified person**”

- Applied physics
- General and inorganic chemistry
- Organic chemistry
- Analytical chemistry
- Pharmaceutical chemistry, including analysis of medicinal products
- General and applied biochemistry (medical)
- Physiology
- Microbiology
- Pharmacology
- Pharmaceutical technology
- Toxicology
- Pharmacognosy (study of the composition and effects of the natural active substances of plant and animal origin).



The average EU PET course





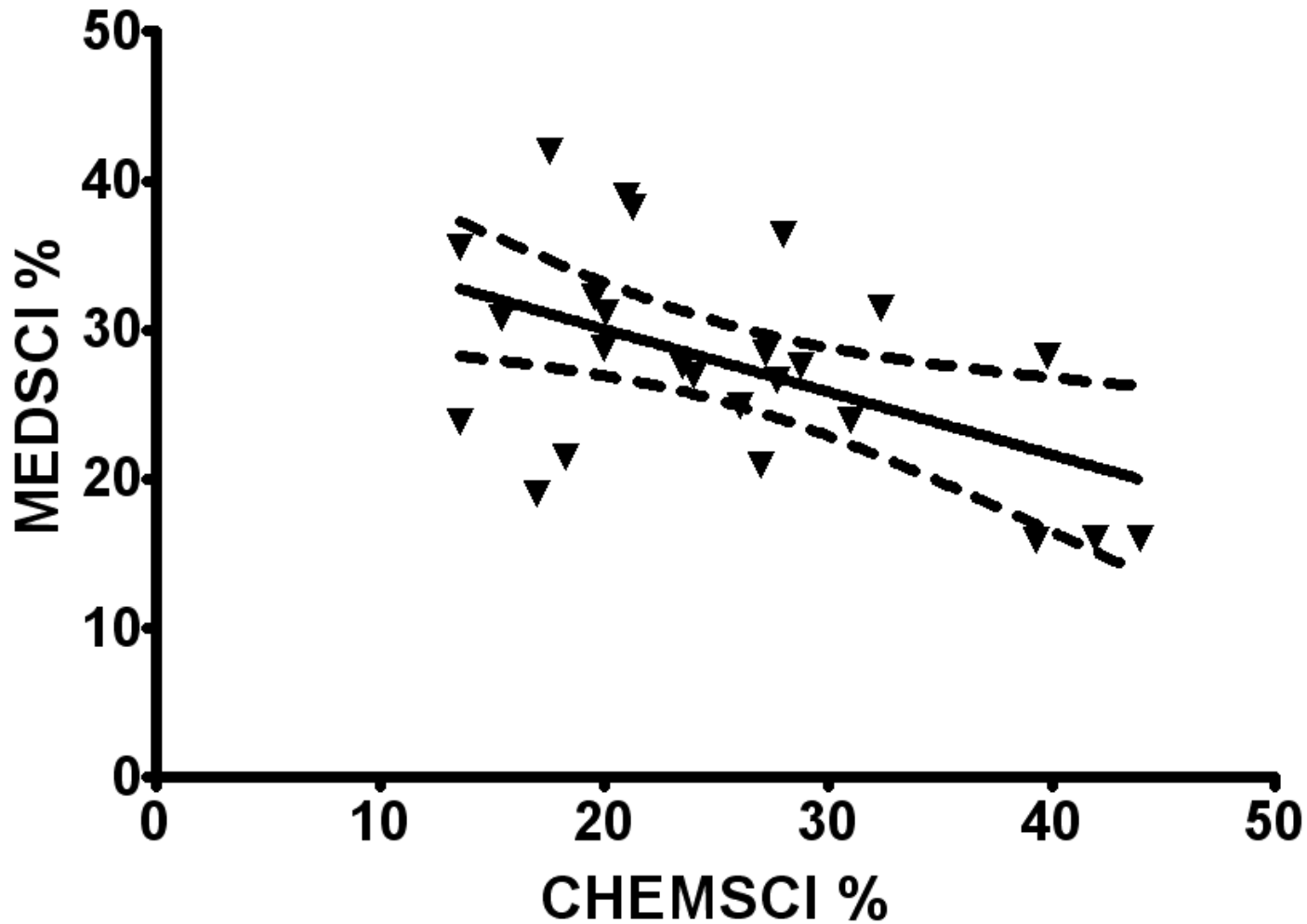
Historical \pm contemporary adherence of European pharmacy departments

(n=31 faculties in 31 countries)

	<u>Number</u>	<u>%</u>
To a medical faculty	16	52
To a science faculty	7	22
Independent	8	26



Correlation CHEMSCI with MEDSCI





Pharmaceutical Technology “PHARMTECH”

Drug formulation

Drug disposition, metabolism, pharmacokinetics

Novel drug delivery systems

Drug design

Drug production

Quality assurance in production

Management strategy in industry

Drug registration

Ophthalmic preparations

Medical gases

Cosmetics

Research projects in PHARMTECH



Pre-graduate pharmaceutical technology course (year 1 onwards)

(n=31 faculties in 31 countries)

	<u>Mean±SEM</u>
Pharmaceutical technology (hours over 5 years)	628±57/faculty
Total hours for pharmacy degree course over 5 years	5348±335
Pharmaceutical technology hours as % total	11.7%

Plus ~12.7% research work = 24.4% total hours



Master courses in industrial pharmacy (with research element)

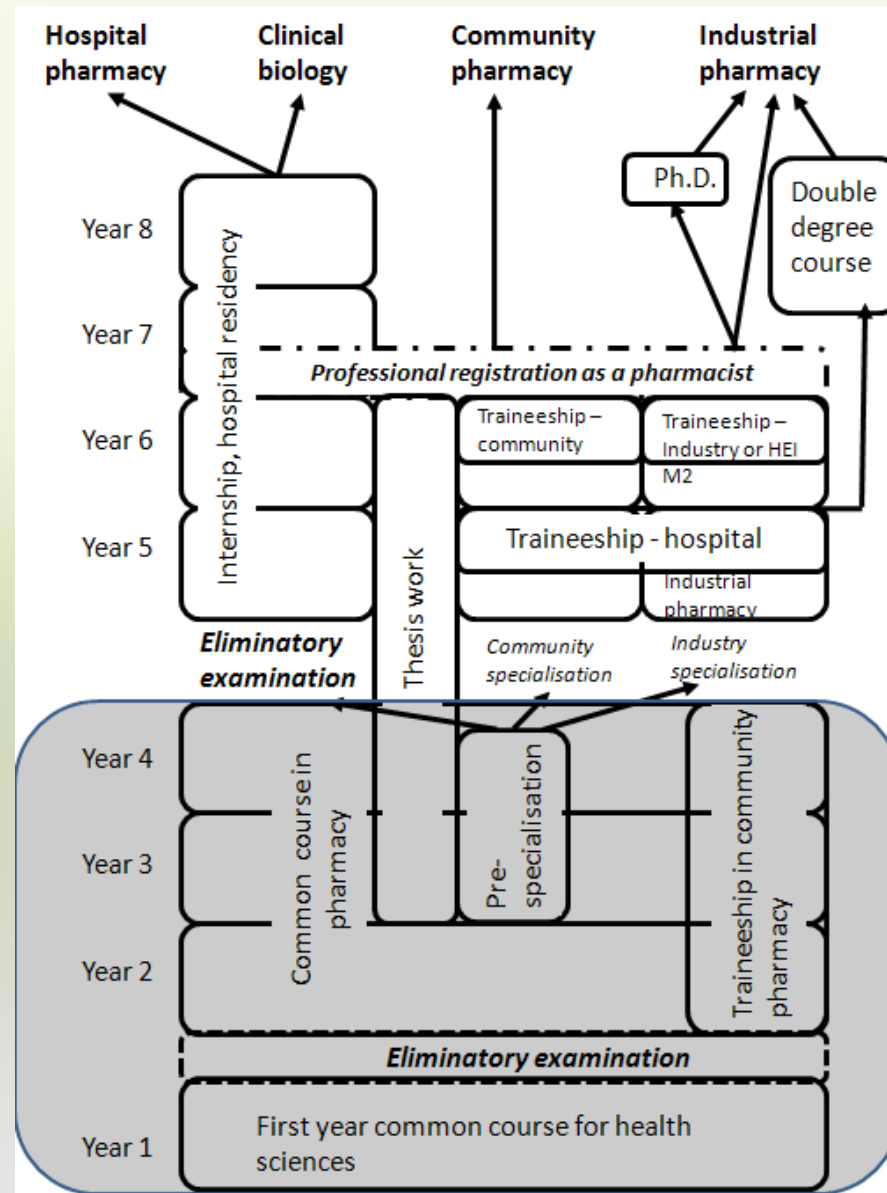
(n=31 faculties in 31 countries)

	<u>Number of faculties</u>	<u>%</u>
Pre-graduate course (4th and/or 5th year)	10	32
Post-graduate course (6th year onwards)	11	35



**Lorraine
University,
Nancy, France**

**The pharmacy
degree
structure**





Conclusions:

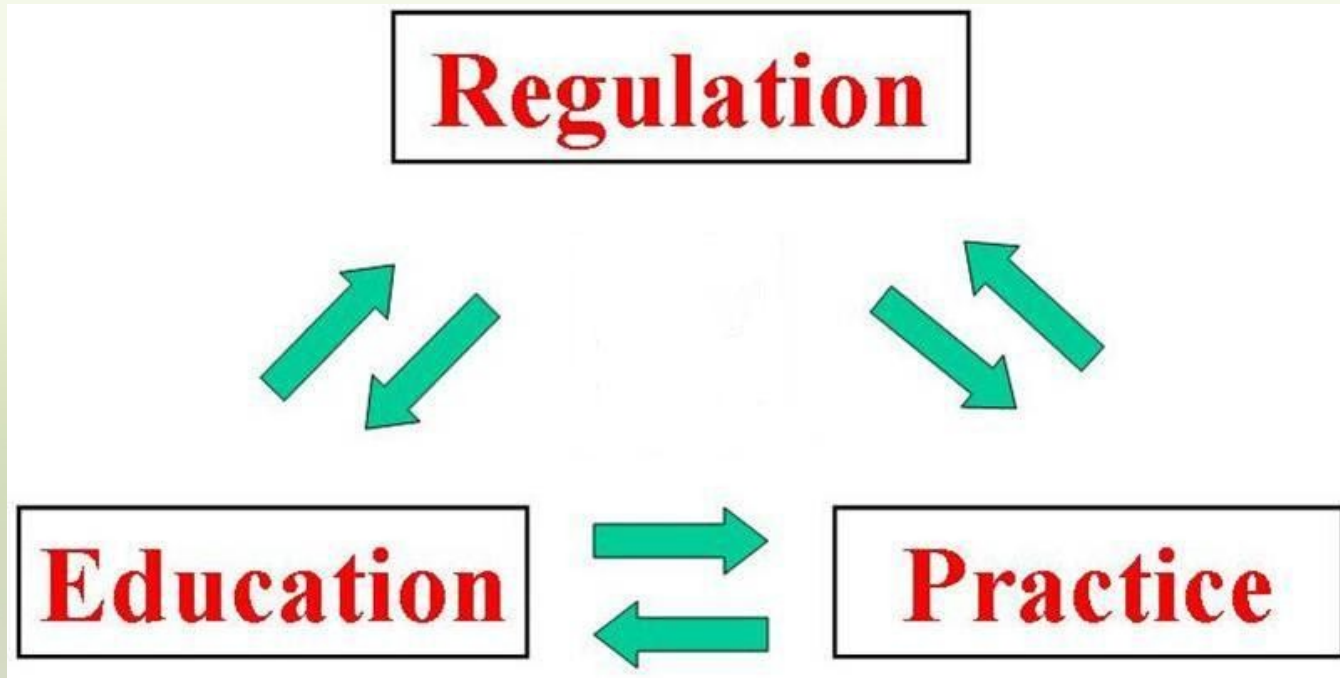
- EC directives orient PET towards industry
- Based on PHARMINE WP7 results, PET study hours
 - 25% on CHEMSCI
 - 12% on PHARMTECH
 - 13% on project/research
 - total: 50%
- 32% of HEIs have pre-graduate industrial pharmacy master programmes



Spares



The FUTURE: driving forces for education & training in industrial pharmacy



From Mike ROUSE, ACPE, USA





Lorraine University, Nancy, France – industrial pharmacy degree structure

<u>Year</u>	<u>Courses</u>
1	Basic health sciences (together with medicine and dentistry)
2 through 4	Obligatory fundamental pharmacy study programme with community pharmacy traineeship (together with students in community, hospital pharmacy, and biomedical analysis)
5	6 months: hospital pharmacy traineeship (obligatory) 6 months: industrial pharmacy programme or traineeship in industry (electives)
6	Master 2 nd year (choice)



Lorraine University, Nancy, France – M2 medical engineering

3 months:

Basic courses (obligatory):

- Oral and written communication
- Methodology in medical research
- Pharmacological basis of therapeutics
- etc.

Specialised courses (elective):

- Stem cell therapy
- Antibiotics
- etc.

9 months:

Research project plus written thesis



Lorraine University, Nancy, France – M2 preclinical drug evaluation

3 months:

Basic courses

Statistics and experimental design
Legislation on animal experiments
Comparative animal physiology
Animal health
Written and oral communication

Specialized courses

Safety pharmacology (cardiovascular, pulmonary, CNS, renal)
Telemetry in animal experimentation
Genetic models

9 months:

Research project in pharmaceutical industry or CRO, plus written thesis



***Numerus clausus* limits student numbers and budget for teaching**

Nancy:

- **Pharmacy *numerus clausus*: 126**
- **Medicine *numerus clausus*: 326**
- **Dentistry *numerus clausus*: 88**

Total: 540 graduate per year

Circa 10% follow a M2 course = potential student population of 54 for circa 3 M2 courses (with >15 students per course)

1. **Need to open up to science students (“unlimited”): 800**
2. **Teaching budget limits the number of potential M2 courses**



Some figures on European PET

(n=31 faculties in 31 countries)

	<u>Mean±SEM</u>
Staff	75±9/faculty
Pharmacists graduating/year	118±14/faculty
Total hours over 5 years	5348±335
<u>Project work</u> (hours)* (excluding traineeship)	677±154
Project hours as % total	12.7%

*: often research project