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REVIEW ON TECHNOLOGY TRANSFER IN PHARMACEUTICAL INDUSTRY; FACTS AND STEPS INVOLVED

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ABSTRACT

The Technology Transfer is both integral and critical to drug discovery and development process for new medicinal products this process gives necessary information for technology transfer from R&D to PDL/T.T/MS&T department and development of existing product to the production for commercialization. The article attempts to discuss about the technology transfer process, steps involved in technology transfer, reasons for using technology transfer, importance of technology transfer and the issues involved in the technology transfer in the pharmaceutical industry.

KEYWORDS: Technology transfer, Scale up, Exhibit, pharmaceutical production.

FACTS AND STEPS INVOLVED

Technology Transfer It is **Systematic Documented evidence** to Transfer Analytical Method, Formulation Manufacturing Process, and Packaging Method & API Manufacturing Process **from One location to another Location** with consistent Performance of Method or Process which **will give high degree of assurance** that Specific Process or Method will consistently produce a product meeting its predetermined specifications and quality characteristics.

World Intellectual property organization (WIPO)

Defines"A series of processes for sharing ideas, knowledge, technology and skills with another individual or institution (eg: a company, a university or a governmental body) and of acquisition by the others such ideas, knowledge, technologies and skills.

Application of Technology Transfer in Pharmaceutical Industry

- Formulation Manufacturing Process Transfer
- Analytical Method Transfer
- Packaging Method Transfer
- API Manufacturing Process Transfer

The Technology Transfer Team

Name of Team Member	Responsibilities of Team Member
Process Technology	The central focus for transfer activities, Collates documentation from donor site, Performs initial assessment of transferred project for feasibility, compatibility with site capabilities and establishes resource requirements.
QA Representative	The reviews documentation to determine compliance with marketing authorization, The reviews analytical method with QC to determine capability, equipment training requirements, The initiate's conversion of donor site documentation into local systems and format.
Production Representative	The reviews process instructions/ rules with process technologist to confirm capacity and capability, They consider any safety implication Ex. Solvents, toxic and sanitizing materials, They consider impact on local standard operating procedures, Training requirements of supervisors and operators.
Engineering Representative	The reviews with production representative equipment and Requirements, Initiates required engineering modifications change or part purchase, Reviews preventative maintenance and

	calibration impact Ex. Use of more aggressive ingredients, more temperature sensitive process and modifies accordingly.
QC Representative	The reviews analytical requirements, The availability with instruments, The responsible for analytical method transfer for drug substances and drug product.

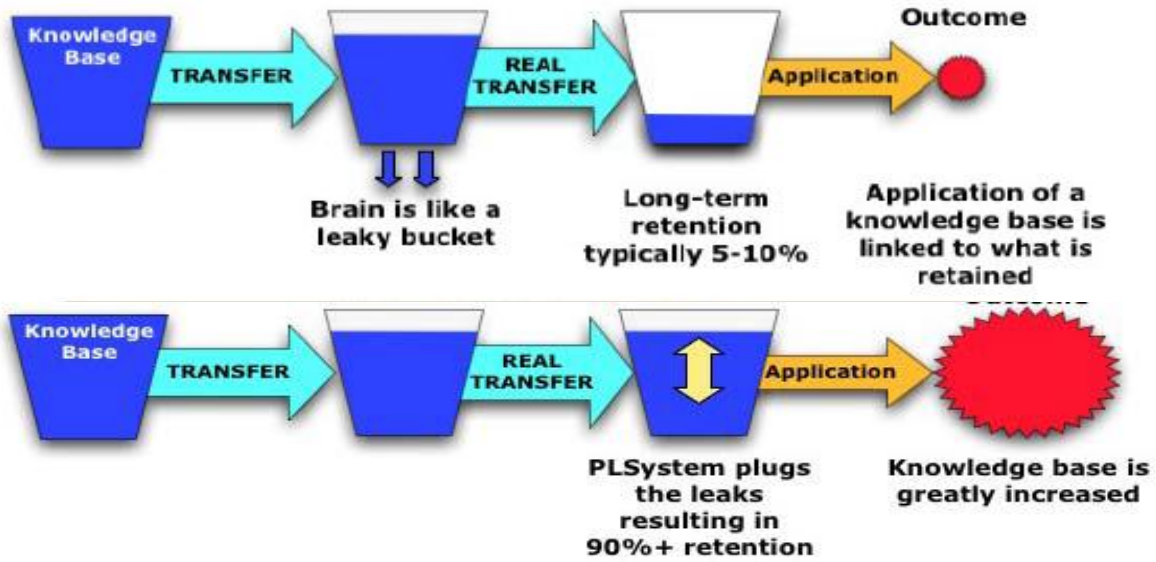
STAGES FROM F&D TO MAUNFACTURING UNIT		
Stage 1 :	**Literature Search**	
Stage 2 :	**Active Sourcing**	- Evaluate at least two suppliers fully. - Request for the samples, COA and Specifications.
Stage 3 :	**Active Evaluation**	- DMF availability - Compliance with USP monograph - Impurity profile and stability - Potential Polymorphic forms - Commitment for physical specifications
Stage 4 :	**Active Purchasing**	
Stage 5 :	**Active Testing**	
Stage 6 :	**Innovator's Product Purchasing**	
Stage 7 :	**Innovator's Product Testing**	- **Evaluate physical parameters such as** - Tablet shape - Tablet color - Pack sizes containers materials - Closure types ; cotton and desiccants - **Innovator Physical /Chemical Testing such as** - Weight / Thickness / Hardness - LOD - Friability - Disintegration - Dissolution - Related Substance - **Microscopic observation such as** - Particle size - Crystal shape - Identification of specific Excipient
Stage 8 :	**Bulk Active Testing**	- **Physical characterization of bulk batch** - Polymorphism - Particle size distribution - Bulk density & Tapped density - Microscopic observation - **Chemical characterization** - Assay - Stressed Analysis - Impurity profile - Optical rotation - O.V.I. Testing
Stage 9 :	**Excipients Selection**	- Pre-Formulation Studies
Stage 10 :	**Container Closure System**	- Manufacturers and suppliers - Material composition - Requirement of cotton and desiccants - Manufacturer's DMF numbers for all component parts
Stage 11 :	**Selection of Manufacturing Process**	- **Granulation** - Wet Granulation - Dry Granulation - Dry Mixing - Slugging Method - Blending Time Optimization - **Evaluation of Physical Properties of Granules** - Flow properties - Bulk Density & Tap Density

		- Particle-size distribution - Compressibility - Hausner's Ratio - **Evaluation Physical Properties of Compressed Tablets** - Weight - Thickness - Hardness - LOD - Friability - Disintegration
Stage 12 :	**Bulk Active Purchased**	
Stage 13 :	**Analytical Evaluation**	- Dissolution - in USP medium (Multipoint profiles) and other relevant media versus Innovator's product - Validation of analytical package i.e. Assay; Dissolution, Content Uniformity completed prior to Process Qualification
Stage 14 :	**Process Optimization**	
Stage 15 :	**Analytical Evaluation**	
Stage 16 :	**Scale Up**	
Stage 17 :	**Process Qualification - Pre-Exhibit / PO Batch**	
Stage 18 :	**Pivotal Production - Exhibit / Submission Batch**	
Stage 19 :	**Bio Study Results Evaluation**	
Stage 20 :	**Pre-Submission Auditing**	
Stage 21 :	**Submission**	
Stage 22 :	**Process Validation**	
Stage 23 :	**Process Re-validation**	

When does Technology Transfer occur?

- Idea to Discovery Lab
- Discovery Lab to Development Lab
- Development Lab to Kilo Lab
- Lab to Pilot Plant
- Kilo Lab to Pilot Plant
- Pilot Plant to Semi-works (other pilot plant)
- Pilot Plant/ Semi-works to Manufacturing
- Manufacturing to Manufacturing

KNOWLEDGE TRANSFER PROCESS



Need an Effective Transfer Process that plugs the leaks and yields Better Retention

TECHNOLOGY TRANSFER SUCCESS CRITERIA

Team work, most of the time…….. Sending and Receiving Unit

" Technology transfer is not a one way street".
The sending & receiving unit must be equally involved in the process to ensure success.

"You can tell pharmacy finally that we have
a product with three batches on Predetermine specification."

IMPORTANCE OF TECHNOLOGY TRANSFER

1. Demonstration of Necessary information from Research & Development to Actual Manufacturing.
2. Demonstration of Necessary information of existing Product between Various Manufacturing Places.
3. For the smooth manufacturing of commercial Products.

Reason For Technology Transfer

- Lack of manufacturing capacity.
- Lack of resources to launch product Commercially.
- Lack of marketing and distribution Capability.
- Exploitation in a different field of application.

Factors Influencing Technology Transfer

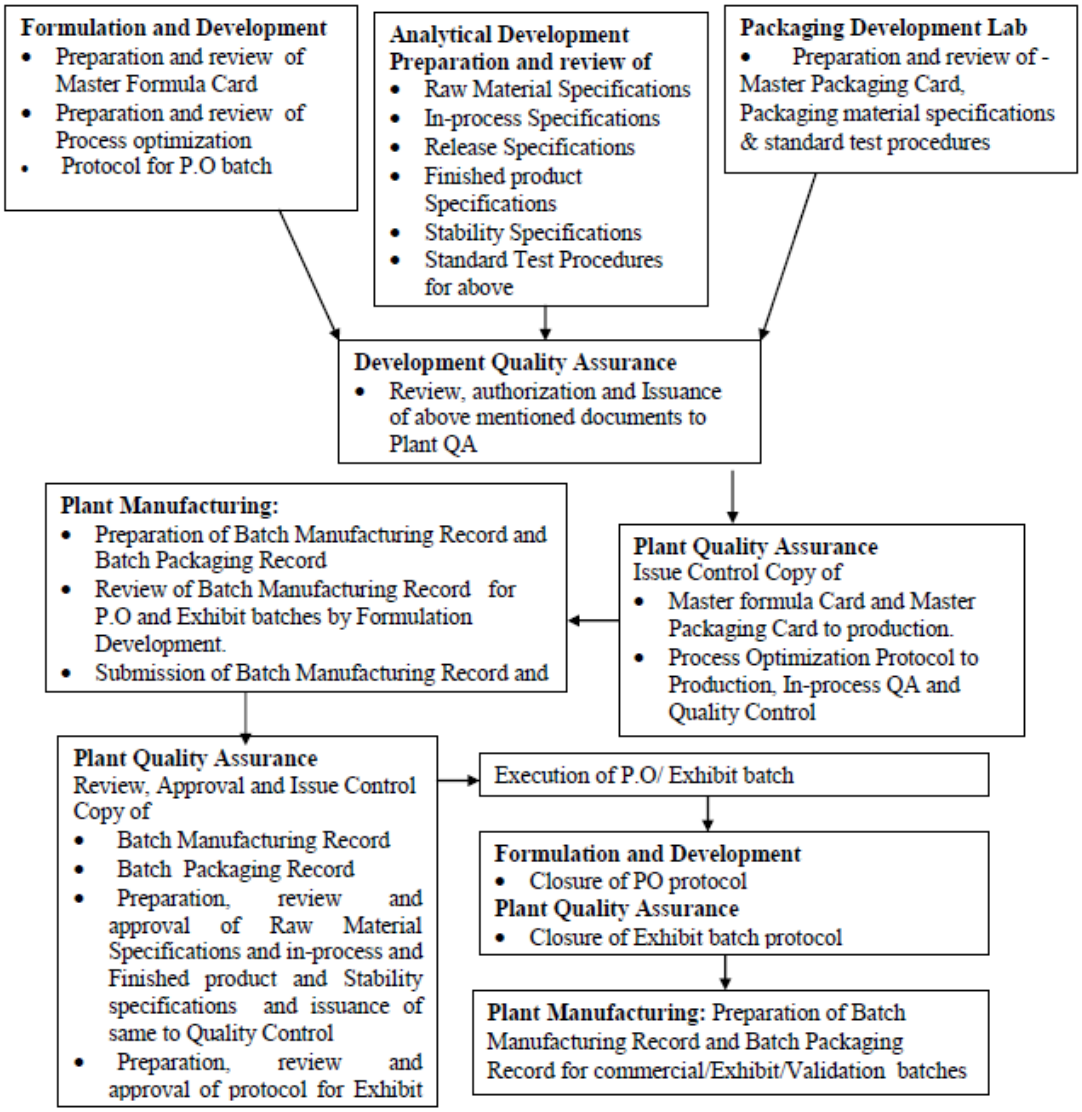
- Good business and manufacturing Practices.
- Potential for competitive pricing.
- Strategic planning.
- Strong economy and environment.
- Transparent and efficient regulation.
- Opportunities for contingency supply.

Function of Technology Transfer

- DOCUMENTATION (TYPICAL TTD PACKAGE)
  - Product Development Report (PDR)
  - Master Formula Card (MFC)
  - Sampling Protocol
  - Master Packaging Card (MPC)
  - Standard Test Procedure (STP)
  - Raw Material Inprocess, Finished & Shelf Life Specification

- EXECUTION OF SCALE UP, PO / PRE-EXHIBIT, EXHIBIT, VALIDATION BATCHES
- COST REDUCTION
- CONTRACT MANUFACTURING
- MANUFACTURING SITE TRANSFER
- COMMERCIAL TROUBLE SHOOTING
- SUPAC LEVEL CHANGES (ANNUAL REPORTABLE, CBE & PAS)

Flowchart For Technology Transfer For Process Optimization And Exhibit Batches



CONCLUSION

- The transfer involves cost and expenditure that is negotiated and agreed upon by the transferee and transferor. The transfer may be said to be successful if the transferee can successfully utilise the technology for business gains and eventually assimilate it
- Appropriate efficiency in technology transfer from development to commercialization can be achieved through better communication and documentation by technology transfer team. A cooperative effort by team results in more successful initial and consistency runs leading to an earlier license, earlier launch and a greater market share.
- Use of enriched approaches like technology transfer to the development and start-up of new production systems will enable pharmaceutical organizations to fully benefit from the recent improvements in the new drug discovery and to complete more effectively in a rapidly changing marketplace.
- A dedicated technology transfer organization is set up to facilitate and execute the process. Technology transfer can be considered successful if a receiving unit can routinely reproduce the transferred product, process or method against a predefined set of specifications is agreed with a sending unit and/or a development unit.
- Licensing is an imperative spectacle of technology transfer that has gained momentum in pharmaceutical industry by which pharmaceutical firms can contribute to research and development. Technology transfer is a complex issue and should be deal with using holistic approach.

REFERENCES

1. Domb E. Using TRIZ to Accelerate Technology Transfer in the Pharmaceutical Industry; PGTJ, 2004; 3-5.
2. http://www.research.cornell.edu/cotab
3. Reamer A. Icerman L and Youtie J. Technology Transfer and Commercialization: Their Role in Economic Development, EDA Public documents, 2003.

4. Patel DS. An overview for pharmaceutical industry. IBAP, 2010; 1-10.
5. http://aspx?ContentID=193
6. www.gsk.com/policies
7. Technology 4sme.net/images/pdf%20floder/ttps_ http://www.chapter_3.pdf.
8. ISPE Good practice guide. Technology transfer. Tampa, F.L. International Society for Pharmaceutical Engineering, 2003.
9. Janodia MS, Sreedhar D, Ligade VS, Pise A and Udupa N. Facts of Technology transfer: A perspective of Pharmaceutical industry, J. Intellectual property rights, 2008; 28-34.
10. Ruegger CE, Royce AE and Mollan MJ, Wagner RF, Valazza SJ and Mecadon MR. Scale up of Solid Dosage Forms, 2006.
11. Mendes PC. Licensing and Technology Transfer in the pharmaceuticals Industry Cited, 2010.
12. Reamer A. Icerman L and Youtie J. Technology Transfer and Commercialization:Their Role in Economic Development, 2003.
13. Singh A and Aggarwal G. Technology Transfer in Pharmaceutical Industry: A Discussion. IJPBS, 2009; 1-3.
14. Mahboudi Mand Ananthan BR. Effective factors in technology transfer in the Pharmaceutical Industries of Iran: A Case study. The IUP Journal of Knowledge Management, 2010; 1-2.
15. Biswajit D and Rao N. Transfer of Technology for Successful Integration into the Global Economy: A Case Study of the Pharmaceutical Industry in India. UNCTAD, 2002.
16. Luis Alberto del Río, Nuria Salazar, Carmen Trives, Guidelines for a pharmaceutical technology transfer towards a drug manufacturing plant, Bol. Soc. Quím. Méx, 2007.
17. Del Rio, L.A. Ind. Farm, 2001; 64-68.
18. Bateni M. Selection of Appropriate Technology for Developing Countries, Tadbir, 2000; 108.
19. http://www.amuasi-paper-edited.pdf.
20. www.ncbi.nlm.nih.gov/pubmed/12613797