

Standard Operating Guideline For Pharmaceutical Warehouse

Provides practical guidance on pharmaceutical analysis, written by leading experts with extensive industry experience Analytical Testing for the Pharmaceutical GMP Laboratory presents a thorough overview of the pharmaceutical regulations, working processes, and drug development best practices used to maintain the quality and integrity of medicines. With a focus on smaller molecular weight drug substances and products, the book provides the knowledge necessary for establishing the pharmaceutical laboratory to support Quality Systems while maintaining compliance with Good Manufacturing Practices (GMP) regulations. Concise yet comprehensive chapters contain up-to-date coverage of drug regulations, pharmaceutical analysis methodologies, control strategies, testing development and validation, method transfer, electronic data documentation, and more. Each chapter includes a table of contents, definitions of acronyms, a reference list, and ample tables and figures. Addressing the principal activities and regulatory challenges of analytical testing in the development and manufacturing of pharmaceutical drug products, this authoritative resource: Describes the structure, roles, core guidelines, and GMP regulations of the FDA and ICH. Covers the common analytical technologies used in pharmaceutical laboratories, including examples of analytical techniques used for the release and stability testing of drugs. Examines control strategies established from quality systems supported by real-world case studies. Explains the use of dissolution testing for products such as extended-release capsules, aerosols, and inhalers. Discusses good documentation and data reporting practices, stability programs, and the Laboratory Information Management System (LIMS) to maintain compliance. Includes calculations, application examples, and illustrations to assist readers in day-to-day laboratory operations. Contains practical information and templates to structure internal processes or common Standard Operating Procedures (SOPs). Analytical Testing for the Pharmaceutical GMP Laboratory is a must-have reference for both early-career and experienced pharmaceutical scientists, analytical chemists, pharmacists, and quality control professionals. It is also both a resource for GMP laboratory training programs and an excellent textbook for undergraduate and graduate courses of analytical chemistry in pharmaceutical sciences or regulatory compliance programs. This book provides stepwise guidance on how to evaluate, audit, qualify and approve an active pharmaceutical ingredient (API) and packaging material manufacturer and supplier to enhance the GMP within the industry. The book will also be beneficial for institutions conducting pharmaceutical technology courses in terms of GMP and GLP applications. The Pharmaceutical Vendors Approval Manual provides readers and front-line health care products manufacturers, R&D management and biotech laboratories all the information they need to know to develop a GMP-

oriented industry with trained and skilled personnel and manufacture products that meet GMP and regulatory requirements. This book provides a simple, concise and easy to use reference tool covering basic quality concepts and the elements of vendor's assessment, qualification and approval required by the pharmaceutical educational institutions and professional certification bodies. It is equally relevant to Quality Assurance officers, Quality Control Analysts, Quality Auditors and other personnel involved in GMP/GLP services in the company. The book will also be beneficial for the institutions conducting Pharmaceutical technology study courses in terms of GMP and GLP applications. This book provides readers and front-line health care products manufacturers, R&D management and biotech laboratories all the information they need to know to develop a GMP-oriented industry with trained and skilled personnel and manufacture products that meet GMP and regulatory requirements covers basic quality concepts and the elements of vendor's assessment, qualification and approval required by the pharmaceutical educational institutions and professional certification bodies provides stepwise guidance on how to evaluate, audit, qualify and approve an API and packaging material manufacturer and supplier to enhance the GMP within the industry provides ready to use regulatory documentation, e.g. letter of commitment, questionnaire, SOP, etc. required for API and Packaging Materials contract Provided material can be easily tailored to incorporate changes to add in-house vendor's qualification requirements. Erfan Syed Asif, Ph.D is a Senior Consultant at PharmEng Technology.

This handbook features contributions from a team of expert authors representing the many disciplines within science, engineering, and technology that are involved in pharmaceutical manufacturing. They provide the information and tools you need to design, implement, operate, and troubleshoot a pharmaceutical manufacturing system. The editor, with more than thirty years' experience working with pharmaceutical and biotechnology companies, carefully reviewed all the chapters to ensure that each one is thorough, accurate, and clear.

With its coverage of Food and Drug Administration regulations, international regulations, good manufacturing practices, and process analytical technology, this handbook offers complete coverage of the regulations and quality control issues that govern pharmaceutical manufacturing. In addition, the book discusses quality assurance and validation, drug stability, and contamination control, all key aspects of pharmaceutical manufacturing that are heavily influenced by regulatory guidelines. The team of expert authors offer you advice based on their own firsthand experience in all phases of pharmaceutical manufacturing.

Handbook of Modern Pharmaceutical Analysis

Analytical Testing for the Pharmaceutical GMP Laboratory

Quality Assurance of Aseptic Preparation Services Standards Handbook

Standard Operating Procedures in Vitro Toxicology

Applied Pharmaceutical Practice

Pharmacy Practice E-Book

Standards for unlicensed aseptic preparation in the UK, as well as practical information for implementing the standards.

Commonly known as the Orange Guide, this book remains an essential reference for all manufacturers and distributors of medicines in Europe. It provides a single authoritative source of European and UK guidance, information and legislation relating to the manufacture and distribution of human medicines.

Applied Pharmaceutics in Contemporary Compounding, Third Edition is designed to convey a fundamental understanding of the principles and practices involved in both the development and the production of compounded dosage forms by applying pharmaceutical principles.

Are your exams coming up?

Regulations and Quality

Guidance for Preparing Documentation that Meets Regulatory Requirements

Epidemiology and Prevention of Vaccine-Preventable Diseases, 13th Edition E-Book

Guidelines for Writing Effective Operating and Maintenance Procedures

Rules and Guidance for Pharmaceutical Manufacturers and Distributors (Orange Guide) 2017

British Pharmacopoeia 2021 [print Edition]

This book describes the role modern pharmaceutical analysis plays in the development of new drugs. Detailed information is provided as to how the quality of drug products is assured from the point of discovery until the patient uses the drug. Coverage includes state-of-the-art topics such as analytics for combinatorial chemistry and high-throughput screening, formulation development, stability studies, international regulatory aspects and documentation, and future technologies that are likely to impact the field. Emphasis is placed on current, easy-to-follow methods that readers can apply in their laboratories. No book has effectively replaced the very popular text, *Pharmaceutical Analysis*, that was edited in the 1960s by Tak Higuchi. This book will fill that gap with an up-to-date treatment that is both handy and authoritative.

The fifth edition of *Pharmaceutical Practice* has been totally overhauled and restructured to bring the contents completely up to date and to reflect emerging new roles for pharmacists both within the traditional employment areas of hospital and community pharmacy, as well as other developing roles supporting the public health agenda, governance, risk management, prescribing and pharmaco-economics. It covers a wide range of subjects relevant to pharmacy practice, including communication skills, managing a business, quality assurance, dispensing, calculations, packaging, storage and labeling of medicines, sterilization, prescriptions, hospital-based services, techniques and treatments, adverse drug reactions, cost-benefit, and medicines management. Each chapter begins with Study Point and ends with Key Points to reinforce learning.

Appendices include medical abbreviations, Latin terms and abbreviations, systems of weights and measurements, presentation skills and key references. Self-assessment questions for more complex areas of pharmaceutical practice. New chapters on control of medicines; control

of health professionals and their staff; ethics in practice; Standard Operating Procedures; structure and organisation of pharmacy; veterinary pharmacy; appliances; public health, and pharmacy interventions. New editor on the team, Jennie Watson. Many new contributors, comprising practising pharmacists, teachers of pharmacy, and pharmacists with joint appointments between hospital/community pharmacy and universities.

Writing and Managing SOPs for GCP is the first book to discuss managing Standard Operating Procedures (SOPs) for Good Clinical Practice (GCP) from conception to retirement. It recommends approaches that have a direct impact on improving SOP and regulatory compliance. Throughout the text, the book provides a user 's point of view to keep topics focused on the practical aspects of SOPs and SOP management. The idea of specifically calling out approaches to SOP creation and maintenance in an effort to make it easier for users to stay in compliance is a theme found throughout all book chapters. Examples in each chapter provide accurate reflections of real-world experiences to illustrate the discussion. The book also includes an example "SOP of SOPs" along with an associated SOP template.

To stay in compliance with regulations, pharmaceutical, medical, and biotech companies must create quality SOPs that build in the regulatory requirements into actions and describe personal flow, internal flow, flow of information, and processing steps. Quality Operations Procedures for Pharmaceutical, API, and Biotechnology and the accompanying CD-ROM take into account all major international regulations, such as FDA, EU GMP, cGMP, GLP, PDA technical monographs, PDA technical reports, PMA concepts, journals of PDA, GCP, and industry standard ISO 9000, to be in compliance with documentation guidelines. No other resource deals exclusively with the key elements of quality control and quality assurance procedures for pharmaceutical operations and provides hands-on templates to be tailored to achieve global regulatory compliance. The book provides instant answers about what to include in critical quality assurance and quality control SOPs and how to enhance productivity. The CD-ROM contains nineteen quality control and thirty-three quality assurance SOPs designed so that users can input them into their computers and use their Microsoft Word programs to edit and print these documents. The book ensures minimization of the number of documents, helping to reduce the nightmare-like aura that surrounds an FDA audit. The SOPs exclusively refer to the documents specially required for compliance; however, specific formats are not included to ensure that the electronic templates can be easily used by pharmaceutical, bulk pharmaceutical, medical device, and biotechnology industries. The combination of text and CD-ROM presents a ready-to-use resource on

the quality systems of aseptic pharmaceutical non-aseptic production and to provide general information and guidelines. They comprise a tool that can be used to develop a set of quality SOPs in order to support the road map established for the on-time successful start-up of the facility operation in compliance with the GMP requirements.

Pharmaceutical Quality Control Lab Guidebook

Writing High-quality Standard Operating Procedures

EPA Requirements for Quality Management Plans

A Comprehensive Quality Manual for API and Packaging Material Approval

Validating Clinical Trial Data Reporting with SAS

This is the fourth volume of Standard Operating Procedures (SOPs) compiled from documents prepared in these laboratories in part fulfilment of the requirements of various Good Laboratory Practice (GLP) regulations and guidelines. SOPs have now become an everyday feature of work in most industrial and contract toxicology laboratories. They provide a written definition of the mechanics of unit operations which together comprise the framework for experiments in safety evaluation. Metabolic studies and analytical chemistry are closely linked to toxicology since they embody essential aspects of the overall assessment of product safety. Some authorities consider certain parts of these subjects to be outwith the scope of the GLP requirements but for the reasons stated this is contrary to our own view. We have tried where possible to define in SOP format for use in our own laboratories the unit operations involved in these disciplines and they form the basis of this volume. Some relevant material from previous volumes has been brought together in updated form and is also presented here for completeness. Dr I P Sword Managing Director Inveresk Research International Musselburgh EH21 7UB Scotland ix Introduction GENERAL 1. The Food and Drug Administration of the US Government published its Good Laboratory Practice Regulations for Non-Clinical Laboratory Studies in the Federal Register (22 December 1978). The Regulations are the culmination of a number of years of investigation into the standards to which safety evaluation studies were performed in laboratories in the USA. The accompanying CD-ROM contains clinical examples, critical appraisals and background papers.

An essential book for all those clinicians and reserachers undertaking clinical trials. It will ensure that all involved in clinical trials undertake their investigation according to standard operating procedures.

Updated annually, the British Pharmacopoeia (BP) is the only comprehensive collection of authoritative official standards for UK pharmaceutical substances and medicinal products. It includes approximately 4,000 monographs which are legally enforced by the Human Medicines Regulations 2012. Where a BP monograph exists, medicinal products or active pharmaceutical ingredients sold or supplied in the UK must comply with the

relevant monograph. All monographs and requirements of the European Pharmacopoeia (Ph. Eur.) are reproduced in the BP, making the BP a convenient and fully comprehensive set of standards that can be used across Europe and beyond.

Proceedings of a Workshop

Pharmaceutical Manufacturing Handbook

Standard Operating Procedures for All Doctors

Prepared for the Traditional Chinese Medicine Clinical Trials Network, NICM

TCM Collaborative Centre

Validation Standard Operating Procedures

Pharmaceutical Practice

The Public Health Foundation (PHF) in partnership with the Centers for Disease Control and Prevention (CDC) is pleased to announce the availability of Epidemiology and Prevention of Vaccine-Preventable Diseases, 13th Edition or “The Pink Book” E-Book. This resource provides the most current, comprehensive, and credible information on vaccine-preventable diseases, and contains updated content on immunization and vaccine information for public health practitioners, healthcare providers, health educators, pharmacists, nurses, and others involved in administering vaccines. “The Pink Book E-Book” allows you, your staff, and others to have quick access to features such as keyword search and chapter links. Online schedules and sources can also be accessed directly through e-readers with internet access. Current, credible, and comprehensive, “The Pink Book E-Book” contains information on each vaccine-preventable disease and delivers immunization providers with the latest information on: Principles of vaccination General recommendations on immunization Vaccine safety Child/adult immunization schedules International vaccines/Foreign language terms Vaccination data and statistics The E-Book format contains all of the information and updates that are in the print version, including:

- New vaccine administration chapter
- New recommendations regarding selection of storage units and temperature monitoring tools
- New recommendations for vaccine transport
- Updated information on available influenza vaccine products
- Use of Tdap in pregnancy
- Use of Tdap in persons 65 years of age or older
- Use of PCV13 and PPSV23 in adults with immunocompromising conditions
- New licensure information for varicella-zoster immune globulin

Contact bookstore@phf.org for more information. For more news and specials on immunization and vaccines visit the Pink Book's Facebook fan page

This comprehensive book covers a wide range of subjects relevant to pharmacy practice, including communication skills, managing a business, quality assurance, dispensing, calculations, packaging, storage and labeling of medicines, sterilization, prescriptions, hospital-based services, techniques and treatments, adverse drug reactions, pharmacoeconomics, and medicines management. Features useful appendices on medical abbreviations, pharmaceutical Latin terms, weights and measures, and presentation skills. This is a core text for pharmacy practice and dispensing

modules of the pharmacy curriculum Covers key exam material for essential review and test preparation Features a user-friendly design with clear headings, chapter summaries, helpful boxes, and key points Text restructured with 14 new or radically revised chapters. All text revised in light of current pharmaceutical practice. New design using two colours. Pharmaceutical Quality Control Lab teaches the history of regulations affecting quality control in pharmaceutical labs and their importance, and then goes into the specifics of dealing with results in a pharmaceutical lab. It contains an interactive flow chart, numerous step-by-step instructions, questions, SOP model, and a case study. It is suitable for GMP training. This book analyses the implementation of global pharmaceutical impact standards in the European risk regulation framework for pharmaceuticals and questions its legitimacy. Global standards increasingly shape the risk regulation law and policy in the European Union and the area of pharmaceuticals is no exception to this tendency. As this book shows, global pharmaceutical standards set by the International Council for Harmonisation of Technical Requirements for the Registration of Pharmaceuticals for Human Use (ICH), after they are adopted through the European Medicines Agency (EMA), are an important feature of the regulatory framework for pharmaceuticals in the EU. In addition to analysing the influence of these global standards in the EU legal and policy framework, the book questions the legitimacy of the Union's reliance on global standards in terms of core administrative law principles of participation, transparency and independence of expertise. It also critically examines the accountability of the European Commission and the European Medicines Agency as participants in the global standard-setting and main implementation gateway of the global pharmaceutical standards into the European Union.

Applied Pharmaceutics in Contemporary Compounding

EPA QA/R-2

Standard Operating Procedures for Primary Care Physicians

Standard Operating Procedures (SOPS) for Clinical Trials in

Complementary and Alternative Medicine

The International Council for Harmonisation

Continuous Manufacturing for the Modernization of Pharmaceutical Production

This User's Guide is intended to support the design, implementation, analysis, interpretation, and quality evaluation of registries created to increase understanding of patient outcomes. For the purposes of this guide, a patient registry is an organized system that uses observational study methods to collect uniform data (clinical and other) to evaluate specified outcomes for a population defined by a particular disease, condition, or exposure, and that serves one or more predetermined scientific, clinical, or policy purposes. A registry database is a file (or files) derived from the registry. Although registries can serve many purposes, this guide focuses on registries created for one or more of the following purposes: to describe the

natural history of disease, to determine clinical effectiveness or cost-effectiveness of health care products and services, to measure or monitor safety and harm, and/or to measure quality of care. Registries are classified according to how their populations are defined. For example, product registries include patients who have been exposed to biopharmaceutical products or medical devices. Health services registries consist of patients who have had a common procedure, clinical encounter, or hospitalization. Disease or condition registries are defined by patients having the same diagnosis, such as cystic fibrosis or heart failure. The User's Guide was created by researchers affiliated with AHRQ's Effective Health Care Program, particularly those who participated in AHRQ's DEcIDE (Developing Evidence to Inform Decisions About Effectiveness) program. Chapters were subject to multiple internal and external independent reviews.

A well-understood tenet exists among the FDA and other regulatory bodies: if you didn't write it down, it didn't happen! And if it didn't happen, your company stands to lose time, money, and perhaps its competitive edge. This book provides writers with the tools they need to put effective documentation in place. It offers a broad range of documents representative of the types of writing in the healthcare industry, from the laboratory and QA to manufacturing and regulatory affairs. The book offers valuable insights into managing systems and producing documentation that meets the requirements of the binding regulations.

Spanning every critical element of validation for any pharmaceutical, diagnostic, medical device or equipment, and biotech product, this Second Edition guides readers through each step in the correct execution of validating processes required for non-aseptic and aseptic pharmaceutical production. With 14 exclusive environmental performance evaluations. Spanning chemical, cosmetic and manufacturing industries, this book is aimed at: chemists, clinicians, ecotoxicologists, operation managers, pharmaceutical process managers, quality assurance officers, technicians and toxicologists.

Write It Down

Conducting GCP-Compliant Clinical Research

Evidence-based Medicine

Pharmaceutical Vendors Approval Manual

Standard Operating Procedures Analytical Chemistry and Metabolism

Writing and Managing SOPs for GCP

The EPA investigation of a 1994 chemical plant tragedy concluded that "the explosion resulted from a lack of written safe operating procedures..." While good written procedures can't guarantee zero accidents, they can reduce the number of accidents caused by human error. This new book shows how to remedy this problem through selecting and implementing actions that promote safe, efficient operations and maintenance, improve quality, continuity, profitability and cost control, build upon and record process experience, and promote the concept that operating and maintenance procedures are vital plant components. It includes

practical samples of procedure formats, checklists and many references.

Conducting GCP-Compliant Clinical Research Wendy Bohaychuk and Graham Ball
Good Clinical Research Practices, UK and Canada

The overall aim of this work is to provide a reference book which describes the general framework for conducting GCP-compliant clinical research, particularly pharmaceutical industry clinical research. Wendy Bohaychuk and Graham Ball run a consultancy, GCRP Ltd., which has conducted over 820 GCP audits involving more than 200 companies in the last 10 years. More than 5,000 individuals have been involved in their training courses to help people perform GCP-compliant clinical research. They have authored several books and articles including: Standard operating procedures for investigators Standard operating procedures for sponsors and CROs GCP - an indexed reference Drawing on their wealth of experience, they have produced this enlightening and practical reference work which fills an educational gap in the understanding of GCP at all levels. Written in concise language simple enough to be accessible to those new in the field, the dozens of real-life stories and detailed case studies at the end of each chapter make the book an invaluable resource for the more experienced, highlighting what can go wrong in a clinical study: A study of prostate cancer in the UK - An investigator brochure was not provided. The company argued that a brochure was unnecessary because the drug was already marketed. Indeed it was - for hypertension! A study of cardiovascular surgery in the UK - The consent dates were changed (by overwriting) to indicate that the patients had provided consent before the study started. The original dates post-dated the start of the study. A study of hypertension in Germany - The investigator brochure predated the study by nine years! Checklists are provided throughout the book to help monitors, auditors and investigators ensure that nothing important is overlooked. The authors present the topic of GCP with remarkable clarity, insight and enthusiasm emphasizing that this code of practice was not designed to make studies more difficult for investigators or more expensive for sponsors and CROs but, in the final analysis, to ensure the safety and well-being of study participants and future patients who will benefit from well-conducted, GCP-compliant studies. The U.S. Department of State charged the Academies with the task of producing a protocol for development of standard operating procedures (SOPs) that would serve as a complement to the Chemical Laboratory Safety and Security: A Guide to Prudent Chemical Management and be included with the other materials in the 2010 toolkit. To accomplish this task, a committee with experience and knowledge in good chemical safety and security practices in academic and industrial laboratories with awareness of international standards and regulations was formed. The hope is that this toolkit expansion product will enhance the use of the previous reference book and the accompanying toolkit, especially in developing countries where safety resources are scarce and experience of operators and end-users may be limited.

This comprehensive text provides fundamental information on a broad spectrum of essential topics in health-system pharmacy practice. From an overview of health

delivery systems and hospital pharmacy through various practice settings such as home care, long term care, hospice and palliative care, ambulatory care, and managed care this text focuses on various elements important to health-system pharmacies. The Handbook of Institutional Pharmacy Practice is the first step in developing a career in pharmacy and provides opportunities for study in career enhancement. New chapters included in the FOURTH EDITION: Integrity of the Drug Supply Overview of the History of Hospital Pharmacy in the United States Interprofessional Teams/Collaborative Practice Models Development, Implementation and Monitoring Therapeutic Plans and Evidence-Based Medicine Good Clinical Practice

SOPs Clear and Simple for Healthcare Manufacturers

Pharmaceutical Practice E-Book

Pharmaceutical Process Validation

A Guide to Developing Standard Operating Procedures

How to Practice and Teach EBM.

Pharmaceutical, biotechnology, and life-sciences companies rely on standard operating procedures (SOPs) to ensure the quality and safety of their products and services. But in many cases, these documents themselves lack quality. Containing important technical instructions, SOPs are often wordy, confusing, and imprecise, thereby increasing quality and compliance risks for the organization. The problem is not lack of technical knowledge. The professionals who write SOPs are technically sound, but what they lack is sound technical writing skills. An ideal resource for engineering professionals, technical writers, and students alike, Writing High-Quality Standard Operating Procedures: A Practical Guide to Clear, Concise, and Correct SOPs offers a step-by-step roadmap to take your SOP writing skills to the next level. Under the guidance of Atul Mathur, an engineer and a technical writer with over fifteen years of experience, you'll learn to identify the attributes of high-quality SOPs; create right content structure for SOPs; follow a systematic process for writing SOPs; apply best practices in SOP writing; and avoid common errors. Honing your technical writing skills is a pivotal step toward high-quality SOPs.

On July 30-31, 2018, the National Academies of Sciences, Engineering, and Medicine held a workshop titled Continuous Manufacturing for the Modernization of Pharmaceutical Production. This workshop discussed the business and regulatory concerns associated with adopting continuous manufacturing techniques to produce biologics such as enzymes, monoclonal antibodies, and vaccines. The participants also discussed specific challenges for integration across the manufacturing system, including upstream and downstream processes, analytical techniques, and drug product development. The workshop addressed these challenges broadly across the biologics domain but focused particularly on drug categories of greatest FDA and industrial interest such as monoclonal antibodies and vaccines. This publication summarizes the presentations and discussions from the workshop.

This indispensable guide focuses on validating programs written to support the clinical trial process from after the data collection stage to generating reports and submitting data and output to the Food and Drug Administration.

The sixth edition of PharmacyPractice brings the contents completely up to date, reflecting emerging new roles for pharmacists both within the traditional employment areas of hospital and community pharmacy, as well as other developing roles supporting the public health agenda, governance, risk management, prescribing and pharmaco-economics. Each chapter begins with Study Points and ends with Key Points to reinforce learning. Appendices include medical abbreviations, Latin terms and abbreviations, systems of weights and measurements and presentation skills. Some chapters also carry

self-assessment questions for more complex areas of pharmaceutical practice. New editor on the team, Louise Cogan. Many new contributors, comprising practising pharmacists, teachers of pharmacy, and pharmacists with joint appointments between hospital/community pharmacy and universities. Now with companion e-book included on StudentConsult New chapters on Consent History Taking/ Gathering Information Advice giving and the pharmacist as a Health Trainer Using calculations in pharmacy practice Continuing professional development and revalidation Intra and inter professional working, The role of the pharmacist in medicines optimization

FASTtrack Applied Pharmaceutical Practice

The Pink Book

A User's Guide

Handbook of Institutional Pharmacy Practice

Registries for Evaluating Patient Outcomes

Quality Operations Procedures for Pharmaceutical, API, and Biotechnology

Revision guide for students giving points of basic information on applied pharmacy practice followed by questions and answers.

A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries

Standard Operating Procedures for Clinical Researchers

Good Clinical, Laboratory and Manufacturing Practices

A Practical Guide to Clear, Concise, and Correct Sops

The Interplay of Global Standards and EU Pharmaceutical Regulation

Production and Processes