Analytical and gravimetric qualification of a chemotherapy production robot

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Background:

Constant **increase** in the **production** of anti-cancer chemotherapies:
60,000 preparations in 2020; >10% in 2 years

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More **staffing constraint**

Twofold problem:

- Increasing number of Musculoskeletal Disorders (**MSD**) among our pharmacy dispenser
- **Delay** in the availability of preparations → **organisational consequences** in Day Hospitals

Optimisation of the daily activity required with **reducing** of the **manual production** share
→ Production of **anticipated standardised campaigns** via a **semi-autonomous robot**

Purpose:

French « *BPP 2019 » – Chapter 3 : Equipment qualification in 3 parts including **performance qualification**

Following installation of this new equipment, the objective of this project was therefore to meet the performance qualification by validating, firstly, the reliability of the production process of the robot by **analytical** and **gravimetric study**.

*« * **BPP** : Bonnes Pratiques de Préparations »*

Material/Methods:

- **Three molecules selected** with different **standard doses** (**SD**) → **Representative panel** of the future production activity of the robot
- Development of **qualification campaign protocol** :

First cycle
- Loading
- Lunching **collection cycle of chemical bottles** for constitution of **product bag**
- Unloading

Weigh-in number 1
- On **outdoor calibrated precision scale** :
  product bag,
  dilution solvant bag,
  final containers 1 to 3 before production

Second cycle
- Loading
- Retrieval of data from the **robot's internal scales** (product bag / solvent bag)
- Lunching **production cycle**
- Retrieval of data from the **robot's internal scales** (product bag / solvent bag)
- Unloading

Weigh-in number 2
- On **external robot scale** (containers produced – RFID detection)
- On **outdoor calibrated precision scale** (rests of solvant bag and product bag + containers produced)
- Unloading

Chemical dosing
- Under **laminar flow cabinet** : **homogenisation** of produced preparation and **sampling** in vials
- QCPrep automatic **dosing** of samples




- **Repeatability** : **TRIAD** → **3** campaigns (one for each molecule) with **3** same containers for SD, **3** days in a row

Results:

- Choice of molecules, containers and standard doses ?

Molecules (density)	Properties	Final containers	Selected SD (en mg)	TV* product (in mL)	TV* added solvent (in mL)	Concentrat° (mg/mL)	Pre-analytical dilution
				TV : Theoretical volumes			
5-FU (1,029)	Ready to use Large volumes of cytotoxics and solvents	Syringes 60 mL	650	13	38	12,75	1/10
		Elastomeric pump 5mL/h	2500	50	194	10,25	
			4250	85	159	17,42	
			5000	100	144	20,49	
Paclitaxel (0,932)	Ready to use viscous	NaCl containers 250mL	105	17,5	Ø	0,39	Ø
			126	21	Ø	0,46	
			138	23	Ø	0,51	
			150	25	Ø	0,55	
Cytarabine (1,022)	Ready to use	NaCl containers 250mL	1850	37	Ø	6,45	1/2
		500mL	5500	110	Ø	9,02	

- An **Excel file** allows the analysis of the results obtained *(not listed here)*
- Permissible error percentage stipulated : **+/- 10 %**

REACH COMPLIANT

- All values obtained within the acceptability interval :

- Weights of robot scales
- Theoretical volumes taken
- Theoretical concentrations of our preparations

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- Outdoor calibrated precision scale weight
- Volumes duly taken (obtained by mass study)
- Concentrations obtained by *QCPrep* dosage

Discussion - Conclusion:

- **Parallel studies** : pump performance, gravimetric et analytic
  → **reliability of the production process**
- Intrinsic specificities for each equipment
  → no specific operational protocol described in the literature

The qualification plan developed is therefore on example among others

- To continue performance qualification: the **microbiological study**. Media Fill Test (MFT) and environmental microbiological controls will be part of coming program.