Al-Rasheed University
College
Medical Instrumentation
Tech. Eng.

Clinical Chemistry Instrumentation and Technology

Lecture (3)
Quality Control

2nd stage – 2022/2023

Lecturer: Dr. Suhail Najm Abdullah

Quality control is statistical processes used to assess the reliability (quality) of any clinical chemistry equipment.

- It can be achieved by testing the equipment using two **quality control products**.
- Any type of blood component measurements such as protein, fat, enzymes, hormones, and others, has **a normal range** for the healthy body الجسم السليم and **abnormal ranges** for unhealthy bodyالجسم المريض .
- Quality Control Products are patient-like materials ideally made from human serum, urine or spinal fluid. A control product can be a liquid or freeze-dried (lyophilized) material.
- ***A normal control product*** contains normal levels for the analyte being tested.
- ***An abnormal control product*** contains the analyte at a concentration above or below the normal range for the analyte.

Example: A spectrophotometer جهاز لقياس مستويات العناصر الموجودة في الدم is used to measure the level of potassium (kalemia) (**HypoK. <-- 3.7 – 4.3 → HyperK**.) in the blood of a patient. The quality control log (database) for the equipment is built for 7 days, as shown in Table below:

(a) Describe the unreliable measurement in the table by observation.

7 November – out of range.

(a) Describe the unreliable measurement using standard deviation.

Sudden increase in the std.

$$S = \sqrt{\frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n-1}} \qquad \bar{x} = \frac{\sum_{i=1}^{n} \bar{X}_i}{n}$$

The quality control (QC) Log with Patient Results

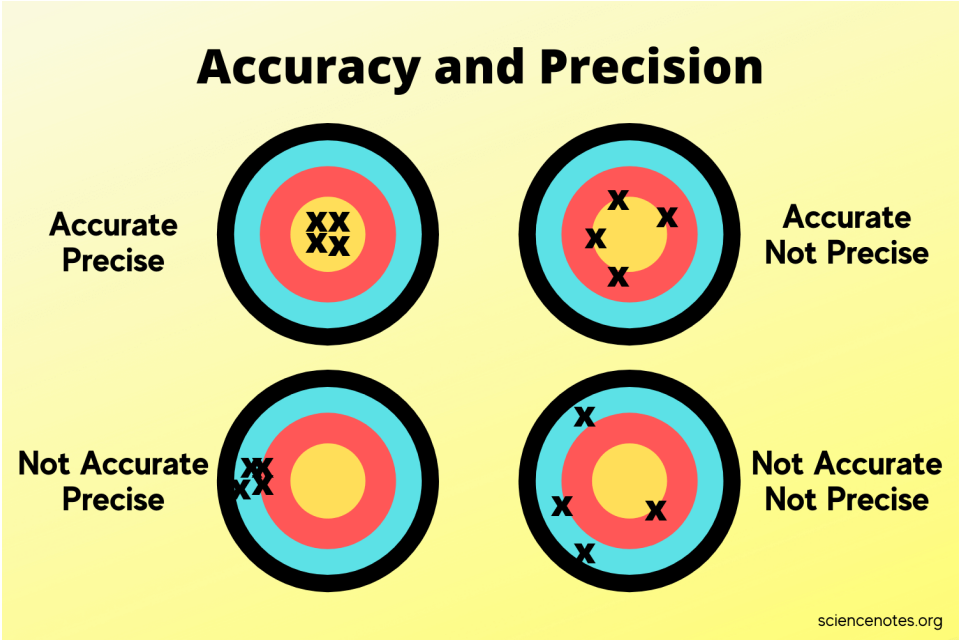
Test: Potassium	**Instrument:** Instrument No. 1		**Unit of Measure:** mmol/L
Range ▸	Level I Normal Control 3.7 – 4.3 mmol/L	Level II Abnormal Control 6.7 – 7.3 mmol/L	Patient Results
1 November	4.0	7.0	4.2, 4.0, 3.8, 5.0, 5.8, 4.2
2 November	4.1	7.0	3.8, 4.4, 4.6, 3.9, 4.8, 4.4, 3.9
3 November	4.0	6.9	4.4, 3.9, 3.7, 4.7
4 November	4.2	7.1	4.7, 5.6, 4.2, 3.7, 4.3
5 November	4.1	7.0	4.2, 4.3, 4.1, 4.3
6 November	4.1	7.0	4.6, 4.4, 5.5, 3.8, 3.2
7 November	4.2	8.0	2.8, 4.6, 4.2, 3.2, 3.9, 4.1, 6.0, 4.3

Accuracy and Precision is important factors for clinical chemistry tests

Accuracy refers to the closeness of a measured value to a standard or known value.

Precision refers to the closeness of two or more measurements to each other.

- It is desirable to get repeated measurements of the same specimen as close as possible.
- **<u>An example of the importance of accuracy in clinical chemistry tests:</u>** a diabetic patient مرضى السكري in a critical care situation may have glucose levels run every 2 to 4 hours. In this case, it is important for the glucose test to be precise because lack of precision can cause loss of test reliability.



Best Laboratory Use

The main objectives of applying the best practices use are to: (a) Avoid the risk of infection (b) Ensure accurate measurements, and (c) Better diagnosis.

BEST LABORATORY USE TO ENSURE LAB SAFETY:

1.	Never eat or drink while working in the laboratory.
2.	Read labels carefully.
3.	Do not use any equipment unless you are trained and approved as a user by your supervisor.
4.	Wear safety glasses or face shields when working with hazardous materials and/or equipment.
5.	Wear gloves when using any hazardous or toxic agent.
6.	Clothing: When handling dangerous substances, wear gloves, laboratory coats, and safety shield or glasses. Shorts and sandals SHOULD NOT be worn in the lab at any time.
7.	If you have long hair or loose clothes, make sure it is tied back or confined.

8.	Keep the work area clear of all materials except those needed for your work. Coats should be hung in your room or placed in locker. Extra books, purses, etc. should be kept away from equipment that requires air flow or ventilation to prevent overheating.
9.	Disposal - Students are responsible for the proper disposal of used material if any in appropriate containers.
10.	Equipment Failure - If a piece of equipment fails while being used, report it immediately a technician. Never try to fix the problem yourself because you could harm yourself and others.
11.	If leaving a lab unattended, turn off all ignition sources مصادر الأشتعال كالغاز والكهرباءand lock the doors.
12.	Clean up your work area before leaving.
13.	Wash hands before leaving the lab and before eating.

BEST LAB USES TO ENSURE CHEMICAL SAFETY

1.	Fill in an “experiment information chart” before conducting an experiment in the chemical lab and let it check and sign by the safety coordinator.
2.	Treat every chemical as if it were hazardous.
3.	Make sure all chemicals are clearly and currently labeled with the substance name, concentration, date, and name of the individual responsible.
4.	Never return chemicals to reagent bottles. (Try for the correct amount and share any excess.)
5.	Never allow a solvent to come in contact with your skin. Always use gloves.
6.	Never "smell" a solvent!! Read the label on the solvent bottle to identify its contents.
7.	Dispose of waste and broken glassware in proper containers and report it to a lab technician.
8.	Clean up spills immediately.

Quiz

Answer all given questions