THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
March, 2023; 3(03), 341-344

Popular Article

Artificial intelligence in clinical veterinary biochemistry: Point of care testing (POCT)

Suruchi Sharma*[1] And Sahil Sharma[2]

[1]M.V.Sc. Veterinary Biochemistry DGCN COVAS, CSKHPKV, Palampur, [2]M.V.Sc. Animal Nutrition DGCN COVAS, CSKHPKV, Palampur

https://doi.org/10.5281/zenodo.7702115

Abstract

An important role is played by clinical veterinary biochemistry in diagnosis of different infectious diseases but sometimes there is delay in the treatment of animals and increase in risk of life of animal due to the laboratory methods. So, an alternative to laboratory diagnosis is Point of care testing. Point of care testing (POCT) is defined by International ISO 22870 as testing that is performed near or at the site of a patient with the result leading to possible change in the care of the patient. The test is performed outside of a diagnostic laboratory near the patient with a rapid turn-around time which enables rapid decision making and faster care or treatment of the patient. POCT also refers to any analytical test performed outside the laboratory and may be located either within a hospital as an adjunct to the main laboratory or for primary healthcare outside the laboratory setting. In animal diagnostics, POCT has been called as pen-side, animal-side, farm-side, barn-side or flock-side testing. With the advancement of artificial intelligence in veterinary this area is likely to grow with many devices being developed and is likely to reach the commercial market.

Introduction

There is increased growth in the veterinary diagnostic market and the most important factor responsible is the increased demand for the animal derived food products and higher rate of occurrence of zoonotic diseases. Disease diagnosis in companion animals such as dogs, cats and horses will boost the demand for veterinary diagnostic by maintaining animal health and safety. A closer connection with the patient is provided with the development of artificial intelligence and technological innovations in health care sector. With the use of smartphone apps, lab-on-a-chip,

Published 06.3.2023

wearable devices and biosensors all offers on spot or near patient beside diagnostics. So, Point of care testing (POCT) is quickly becoming the part of healthcare.

The driving concept in support of POCT is to bring testing closer to the patient and result conveniently and quickly to provide to accelerate diagnosis and subsequent treatment. POCT devices are very handy so, they are very helpful in improving likelihood of patient and physician and care team will receive faster results allowing for immediate clinical management decisions. Further, development, implementation and connectivity of portable diagnostic and monitoring devices for POCT will be part of a successful shift from curative medicine to predictive, personalized and pre-emptive medicine. Literature on POCT began in 1984 with self-monitored blood glucose tests to monitor diabetes in people.

POCT technologies can split into two main categories

The first category is small handheld devices providing quantitative and qualitative determination of an increasing range of analytes like antibody, glucose, electrolytes. The second category includes large and bench top devices that are laboratory instruments which have been reduced in complexity and size. These include small hematology and immunology analyzers (Bhardwaj et al. 2020).

Recent advances in emerging technologies i.e., cellphone-based technologies, paper-based assays which includes antigen assays, antibody assays and nucleic acid assays and lab-on-chip platforms are asphalting the way for next generation point of care testing.

Factors which stimulate POCT demands

- Advancement in technologies- faster and easy to use devices.
- Shortage of laboratory staff.
- Increasing chronic diseases.
- Prevalence of diseases in developing countries.
- Rural areas where there are limited laboratory services.
- Lifestyle diseases such as cardiac diseases and diabetes.

Nowadays biosensors are basis of analysis in many POCT instruments. Biosensors are used for drug screening, measurement of blood cells, glucose, self-testing and detection of cardiac markers. Different other POCT devices which works on different analytical principles such as

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published 06.3.2023

- Lateral flow immunoassays: The recognition agent is antibody that binds to analyte in a biological sensor. Such as measurement of D-dimer, troponin T and myoglobin.
- Electrochemistry in bench top and strip devices.
- Reflectance such as urine and blood dipsticks for glucose.

Ideal requirements for point of care testing

- Single step protocol.
- Results in a minute or less.
- Built-in, integrated calibration and quality control.
- Portable instruments with consumable reagent cartridges.
- Simple operating procedures that do not require a laboratory trained operator.
- Capability of performing on non-processed samples i.e. direct sample analysis on whole blood, CSF, urine and stool samples.
- Low instrument cost.
- Built-in regulatory record keeping.
- Ambient temperature storage for reagents.
- Results should meet analytical specifications that are fit for purpose and with accuracy and precision comparable with those of the laboratory results if needed.

Examples where POCT devices can be used

- Home use.
- Outbreak of disease, veterinary medicine.
- Critical care unit, emergency department.
- Remote rural hospitals.
- Military medicine.
- General practice.

Advantages of point of care testing

- Reduced risk of errors.
- Reduction in clinical visits.
- Improved cost of care.
- Reduction in hospital admissions.

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published 06.3.2023

- Improved patient morbidity and mortality.
- Reduced turn-around time for test results.
- Improved patient management.
- Reduction in the administrative work associated with test reporting.

Disadvantages of point of care testing

- Care-giver requires to perform the test.
- Increase in administrative work associated with training and certification of operators.
- Result is dependent on operators.
- Higher cost of POCT as compared with laboratory testing.

(Vashist et al. 2015)

Conclusion

Recent developments in paper and lab-on-chip based microfluids assays together with novel assay formats have un-matchingly expanded the number and complexity of tests that can be conducted using low cost and disposable POCT kits especially in the developing areas (Bhardwaj et al. 2020).

References

K S Vashist, P B Luppa, Y L Yeo, A Ozcan and T H Luong. Emerging Technologies for Next-Generation Point-Of-Care Testing, Trends in Biotechnology, (2015), vol 33(11): pp 692-705

H Bhardwaj, T P Kaur and R Bhardwaj. Point of Care Testing (POCT) in Clinical Veterinary Biochemistry, Indian Farmer, (2020), vol 7(10): pp 985-991