Biosensor for Rapid Clenbuterol Detection

PATENT NO. PI 2018700001

ANTIBIOTIC ISSUES

- Clenbuterol (β-agonist family antibiotic) is a popular synthetic steroid growth enhancer, however, it is also classified as the banned antibiotic in Malaysia and other countries (USA, Mexico, China, European Union, etc.) due to the side effects (reduce immune system, increase heart rate, etc.).
- Clenbuterol is found being misused in live-stock industries (cow, goat and swine) to increase meat and milk production. Among athletes, this antibiotic is illegally used above permitted level as muscle enhancer (doping) even though it is harmful and carcinogenic to human.

CURRENT DETECTION METHOD
- Analytical GC, GC-MS/MS
- ELISA

Problem/ issues with current system

- Current system: Use of conventional methods and expensive equipment such as HPLC, GC and Mass Spectrophotometer
- Problems: Time consuming, expensive, tedious sample preparation and limited samples analysed at one time, requires trained personnel
- Suggested Solutions: Need simple and reliable technology to give fast and accurate results, in-situ analysis, disposable, certified test method, legally accepted and industrial standard

LC-MS: RM100/test (RM7 mil/70,000 test/year)
Biosensor: RM10/test (RM700,000/70,000 test/year)

INVENTION

- The clenbuterol biosensor adopts electrochemical assay for clenbuterol detection in various samples.
- This product offers lower cost for clenbuterol monitoring in comparison with the established method such as HPLC and LC-MS, meanwhile retained the high sensitivity, high accuracy and high selectivity analysis

Washing buffer
Blocking agent
Conjugate
Substrate

ADVANTAGES

- Simplified immunoassay technique using disposable strip (modified SPCE)
- Immediate digital results with a simple portable strip reader instrument
- Suitable for on-site monitoring
- Qualitative and quantitative analysis
- Detects antibiotics at low range
- High sensitivity (LOD = 5 ppb)
- High accuracy with more than 90% accuracy
- High selectivity to clenbuterol
- Produce rapid results (5 minute test)
- No skilled personnel required

COMPARATIVE TABLE OF THE ANALYTICAL TECHNIQUES FOR CLENBUTEROL DETECTION

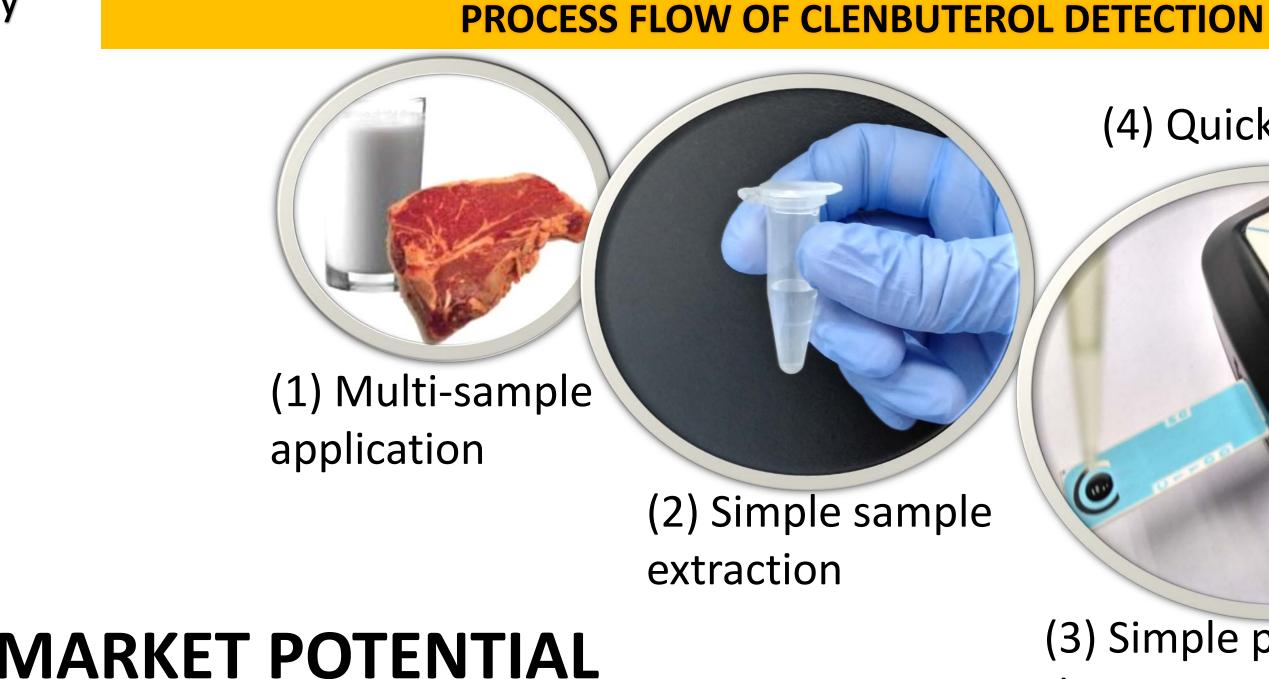|	Biosensor strip	ELISA kit	LC-MS
Time	5 min	1 hour	1-2 days
Operator	Easy to handle & do not required skilled operator	Required skilled operator	Required skilled operator
Results analysis	Digital result with simple and portable instruments (RM500-RM1000)	Required ELISA reader to analyze sample which cost RM20,000-RM30,000	Required very complex instrument and very high cost (RM 250,000-RM500,000)
Reliability	Yes, percentage more than 90%	Yes, percentage more than 80-90%	Yes, percentage more than 99%

PROCESS FLOW OF CLENBUTEROL DETECTION

(1) Multi-sample application
(2) Simple sample extraction
(3) Simple procedure by dropping sample on the strip
(4) Quick digital results

MARKET POTENTIAL

1. Livestock monitoring
   - to make sure the animal is free from antibiotic (clenbuterol) residue.
2. Food safety monitoring
   - to ensure that raw livestock received is clenbuterol-free before the food production process.
   - to ensure the meat product is free from clenbuterol before it is marketable.
3. Athlete monitoring (Doping test)
   - anti-doping rule violation for an athlete

Consumer/End User

- Regulatory agencies
- Live-stock traders, athletes, food outlets, and retailers
- Research institute, private laboratory and public

Industry

- Live-stock industry
- Food and dairy service industry
- Sports

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