RESEARCH ARTICLE

Evaluation of the Quality of Albendazole-based Medicines Seized on the Illicit Market in Côte D'ivoire

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Received: 02/07/2025 **Accepted:** 12/09/2025 **Published:** 15/10/2025

Abstract

Introduction Substandard and falsified medicines pose a global threat, particularly in sub-Saharan Africa where approximately 10 % of consumed medicines fall into this category. In Côte d'Ivoire, such products are often sold in open-air street markets. Among these, anti-infectives—especially anti-parasitics like albendazole—are commonly encountered.

Method: This study assessed the quality of albendazole in medicines seized by the Directorate of Narcotics and Drugs Control (DPSD) using the GPHF-Minilab® kit, a portable quality-control tool.

Results: Of the 15 samples analyzed, 14 exhibited anomalies on visual inspection, 33 % failed disintegration criteria, and 33 % had an assay of active ingredient outside acceptable limits. These findings highlight public health risks associated with consuming these products and underscore the need to strengthen quality-control measures. They also confirm the value of the GPHF-Minilab® in resource-limited settings.

Keywords: GPHF-Minilab®, Albendazole, Substandard, Falsified medicine.

Journal of Applied Pharmaceutical Sciences and Research, (2025); DOI: 10.31069/japsr.v8i3.05

Introduction

Substandard and falsified medical products are recognized by the World Health Organization (WHO) as a global threat, with low-income countries in sub-Saharan Africa being disproportionately affected. In this region, nearly 10 % of consumed medicines are either substandard or falsified [1]. These products not only jeopardize patient health but also carry significant economic and socio-economic burdens [2]. Antiinfectives represent the largest subset of falsified products, leading to specific issues such as antimicrobial resistance and impaired epidemic control [2].

In Côte d'Ivoire, substandard and falsified medicines frequently circulate in street markets, where financially strained populations—and those lacking accessible insurance schemes—seek affordable treatments [3]. Due to the high prevalence of intestinal parasitoses, benzimidazole anthelminthics like albendazole are in heavy demand, making them common on the parallel market.

To address this threat, the WHO has issued guidelines recommending simplified, field-deployable methods for rapid quality screening [4]. The GPHF-Minilab®, developed by the German Pharma Health Fund (GPHF) [5], is one such portable, cost-effective "minilab" for on-site detection of counterfeit and substandard pharmaceuticals.

Albendazole is widely used in Côte d'Ivoire for treating intestinal helminthiases, including mass drug administration campaigns [6]. The primary aim of this work was to evaluate the quality of albendazole in medicines seized by the Directorate of Narcotics and Drugs Control (DPSD) in Abidjan.

Materials and Methods

Quality-control tests were performed on the GPHF-Minilab® platform, which consists of a suitcase containing reference substances, glassware, laboratory equipment, and WHO-standard procedures for on-site medicine screening.

Laboratory materials included:

- Chromatography tanks
- UV lamps (254 nm)
- Glass capillary tubes
- Pre-coated silica gel TLC plates (Merck)
- Graduated pipettes, volumetric flasks, and funnels

Each sample underwent:

- Visual inspection of primary and secondary packaging and tablet appearance, noting manufacturer address, lot number, manufacturing and expiry dates, and presence of a French-language leaflet.
- Disintegration test in 100 mL of water at 37 °C, with a 30-minute cut-off.

Figure 1: Samples of albendazole based medicines collected by DPSD

- Qualitative and semi-quantitative identification by thin-layer chromatography (TLC), using a mobile phase of toluene:ethylacetate:anhydrous acetic acid and UV visualization at 254 nm. Spot Rf values and intensities were compared against a 400 mg albendazole reference tablet.

Results

Fifteen albendazole samples were collected from DPSD seizures in Abidjan as shown in Figure 1.

Visual Inspection

Table 1 summarizes the visual inspection outcomes for all 15 samples.

The analyzed samples were mainly from five origins, but some of the samples did not have a marked origin : (40 %) India; 2 (13 %) Côte d'Ivoire; 2 (13 %) Ghana; 1 (7 %) UK; 1 (7 %) Togo; 3 (20 %) unknown. Fourteen of 15 samples (93 %) had at least one visual irregularity: missing address (47 %), missing lot number (33 %), or degraded appearance (47 %).

Disintegration Test

Figure 2 presents results of disintegration tests.

The results of the disintegration test of the analyzed samples show that 40% of the samples disintegrated within 30 minutes, similar to the reference substance. However, more than a third (33%) of the samples did not disintegrate within 30 minutes. For 27% of the samples, the disintegration test could not be performed due to the unavailability of products, related to an insufficient number of samples.

Qualitative and Semi-Quantitative TLC

Results are summarized in Figure 3.

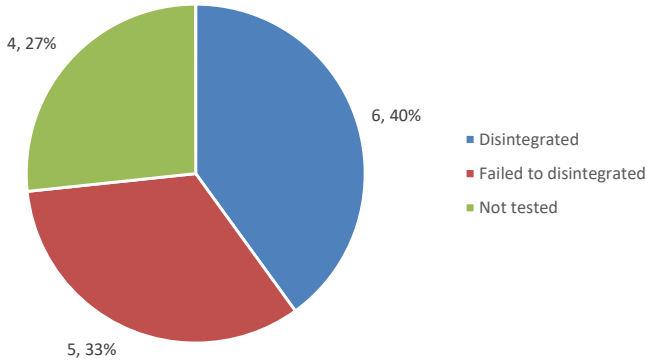

Figure 2: Results of disintegration tests

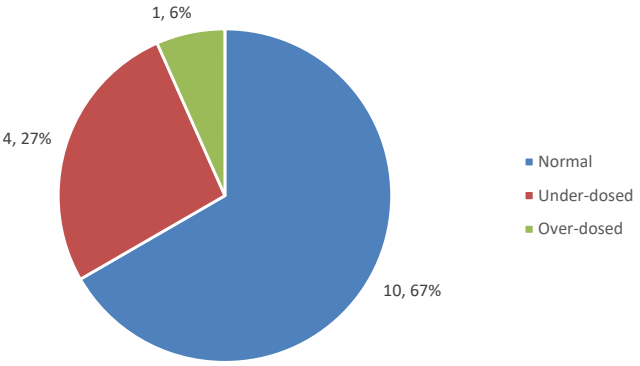

Figure 3: results of semi-quantitative TLC tests

The results of the qualitative and semi-quantitative identification by thin-layer chromatography (TLC) show that out of the 15 samples analyzed, 67% conform to the reference

Table 1: Visual inspection outcomes for all samples

Brand name	*Adress*	*Manufacturing/ and expiry date*	*Lot number*	*French leaflet*	*Origin*	*Appearence*
Abyworm	Present	Present	Present	Present	Ghana	Degraded
Albendazole	Present	Present	Present	Present	India	Degraded
Albendazole tm	Present	Present	Present	Present	Togo	Degraded
Albentel	Absent	Present	Present	Presnent	-	Degraded
Alberon Yellow	Absent	Present	Present	Present	India	Intact
Alberon orange	Absent	Present	Present	Present	India	Intact
Habiben	Present	Present	Present	Present	Ghana	Degraded
Licdazole	Absent	Absent	Absent	Absent	Côte d'Ivoire	Intact
Tacizol	Present	Present	Present	Present	UK/India	Intact
Tanzol	Absent	Present	Present	Present	-	Intact
Tenzol	Absent	Present	Present	Absent	-	Intact
Verex	Present	Present	Present	Absent	Côte d'Ivoire	Degraded
Wormbase	Present	Present	Present	Absent	India	Degraded
Wormron	Absent	Present	Present	Present	India	Intact
Zolex	Present	Present	Present	Absent	India	Intact

in terms of intensity, while 27% of the specialties exhibited an intensity lower than normal and 6% an intensity higher than normal.

Discussion

The results of this study highlight the concerning quality of albendazole-based medicines seized on the illicit market in Côte d'Ivoire using the GHPF Minilab kit. Of the 15 samples analyzed, a significant proportion showed anomalies in visual inspection, disintegration tests, and qualitative and semi-quantitative identification by thin-layer chromatography (TLC).

Visual inspection revealed that several samples had packaging defects, including missing information on secondary and primary packaging or the absence of a French leaflet (absence of manufacturing date, expiration date, batch number, manufacturers, etc.). These elements are essential for patient traceability and safety [7]. The absence of data on the manufacturer, production date, and/or batch number could also be the result of a deliberate intention to evade regulatory controls. It also indicates a lack of quality assurance measures, which are essential in drug production. The degradation of 7 samples could be the result of poor storage conditions, but also of non-compliance with the previously mentioned quality standards [8].

Disintegration tests showed that 40% of the samples disintegrated within the standards, while 33% did not meet the disintegration criteria within 30 minutes. These results highlight the potential public health risks of using these products. Indeed, inadequate disintegration can lead to insufficient absorption of the active ingredient, thus compromising the therapeutic efficacy of the drug [9].

TLC analysis revealed that 33% had an intensity lower or higher than normal. These results suggest significant variability in albendazole concentration, which could be due to non-compliant manufacturing practices or the degradation of the active ingredient over time. In terms of risks, an underdosed or overdosed active ingredient can lead to suboptimal treatment due to the low concentration of the active ingredient, with a potential risk of resistance [10]. It can also, in the case of overdose, pose a risk of intoxication.

These results confirm the interest of the Minilab kit adapted for quality control in developing countries [11]. This kit had already been implemented in the same study framework to verify the quality of antimalarial and antibacterial drugs [12,13]. These various studies have shown the presence of products whose suboptimal quality poses a risk to populations sourcing outside the legal drug market.

Conclusion

Among 15 albendazole samples seized on the Ivorian illicit market, 14 exhibited non-compliance in visual inspection, 33 % failed disintegration criteria, and 33 % showed active-ingredient content outside acceptable limits. The GPHF-Minilab® proved valuable for on-site quality assessment, underscoring the urgent need for strengthened regulatory surveillance to protect public health.

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How to cite this article: Kacou AA, Deto NGUJP, Diakité SA, Coulibaly S, Adouko E, Avi KT, Koffi F, Ouattara M. Evaluation of the Quality of Albendazole-based Medicines Seized on the Illicit Market in Côte D'ivoire. Journal of Applied Pharmaceutical Sciences and Research. 2025; 8(3):31-34 Doi : 10.31069/japsr.v8i3.05