Introduction

High-risk human papillomavirus (HPV) is responsible for approximately 5% of human cancers, being the most frequent agent transmitted by sexual contact [1]. This infection is an established carcinogen of the cervix, head and neck, anus, penis, vulva and vagina [2].

The traits known as hallmarks of cancer are biological competences acquired during the multistep development of human cancers [3,4]. Importantly, there exist several long non-coding RNAs (lncRNAs) that seem to regulate the occurrence or the suppression of these hallmarks, and the deregulation of specific lncRNAs has been associated with cancer progression [5,6,7].

LncRNAs are RNA molecules that have no protein coding potential and many of them are recognized as important modulators of gene expression in diverse biological functions and cellular contexts, playing an important role at both transcriptional and post-transcriptional levels (Figure 1), and can positively or negatively regulate gene expression [8].

Aim

> Bring together the current knowledge concerning the actions of IncRNAs to regulate the development of hallmarks of cancer, as well as their potential as biomarkers and potential therapeutic targets in HPV-induced cancers

Methodology

> We performed a review of the literature using the keywords: “IncRNAs”, “hallmarks of cancer”, “HPV-related cancers”, “penile cancer”, “cervical cancer”, “head and neck cancer”, “anus cancer”, “vagina cancer” in databases including ScienceDirect, PubMed, Springer and Scopus from September 1, 2020 to December 18, 2020. All observational studies, as well as case reports were published in English were included.

Results

![Table 1](https://via.placeholder.com/150)

Table 1. LncRNAs in HPV-positive cervical cancers. ADAPTED FROM (Dias, T.R. et al. 2021)

![Figure 1](https://via.placeholder.com/150)

Figure 1. Hallmarks of cancer and IncRNAs associated with each one in HPV-induced malignancies. ADAPTED FROM (Dias, T.R. et al. 2021)

Many IncRNAs are critically involved in promoting or countering the hallmarks of malignancy observed in HPV-induced cancers (Figure 1). Nevertheless, a few specific IncRNAs seem to coordinate pivotal signalling pathways and regulate the development of multiple hallmarks of cancer. However, no studies addressed the role of IncRNAs and other hallmarks such as evading growth suppressors, avoiding immune destruction, enabling replicative immortality and deregulating cellular energetics. While a few studies address the role of IncRNAs in cervical cancer (Table 1) there is a paucity of information concerning IncRNAs in head and neck cancer (Table 2) and no data concerning other HPV-related ano-genital cancers. These are areas that require urgent improvement, considering the key roles that IncRNAs seem to play in HPV-induced cancers in general.

![Table 2](https://via.placeholder.com/150)

Table 2. LncRNAs in HPV-positive head and neck cancers. ADAPTED FROM (Dias, T.R. et al. 2021)

References