ABSTRACT

BACKGROUND
Cervical cancer is the second most common type of cancer in women worldwide. The human papilloma virus (HPV) has recently been shown to specifically target cervical cancer stem cells (CSCs). The ability to identify and characterize CSCs is crucial for understanding cervical cancer. Aldehyde dehydrogenase (ALDH) 1, a detoxifying enzyme responsible for the oxidation of intracellular aldehydes, has been shown to be a stem cell marker in several tissue types and tumors. We investigated the expression pattern of ALDH1 in cervical intraepithelial neoplasia (CIN) and its possible role in carcinogenesis.

DESIGN
Fifty-six cervical biopsy specimens with the diagnoses of normal cervical mucosa, koilocytosis, CIN1, CIN2, and CIN3 were collected from the pathology files at Thomas Jefferson University Hospital. All diagnoses were confirmed by at least two experienced pathologists. Immunohistochemical staining for ALDH1 was performed following a previously published protocol. Any cytoplasmic staining of ALDH1 in the epithelial cells was considered positive. Positive and negative controls were used in each study.

RESULTS
Normal cervical mucosa had no ALDH1 expression. In koilocytosis, 2 of 7 cases showed ALDH1+ cells limited to the basal layer. In CIN1, 11 of 20 cases showed ALDH1+ cells limited to the lower 1/3 of epithelium and the other 9 cases were negative for ALDH1. In CIN2, 7 of the 13 cases showed positive cells limited to the basal layer, 4 cases showed positive cells extending to the mid and upper 1/3 of the mucosa. Two cases were negative for ALDH1. All CIN3/carcinoma in situ (CIS) cases were collected from the pathology files at Thomas Jefferson University Hospital. All diagnoses were confirmed by at least two experienced pathologists. Immunohistochemical staining for ALDH1 was performed following a previously published protocol. Any cytoplasmic staining of ALDH1 in the epithelial cells was considered positive. Positive and negative controls were used in each study.

CONCLUSION
Cervical dysplasias show positive staining for ALDH1 compared to normal cervical mucosa. ALDH1+ cells distribution parallels the degree of cervical dysplasia. CSC, as detected by ALDH1 expression, may play a role in the progression of cervical intraepithelial neoplasia and carcinogenesis.

INTRODUCTION
- Cervical cancer is the second most common type of cancer in women worldwide. The relationship between the development of cervical cancer and infection with certain types of Human Papilloma Viruses (High risk HPV) is well established.
- The human papilloma virus (HPV) has recently been shown to specifically target cervical cancer stem cells (CSCs). The ability to identify and characterize CSCs is crucial for understanding cervical cancer.
- Aldehyde dehydrogenase (ALDH) 1, a detoxifying enzyme responsible for the oxidation of intracellular aldehydes, has been shown to be a stem cell marker in several tissue types and tumors. We investigated the expression pattern of ALDH1 in cervical intraepithelial neoplasia (CIN) and its possible role in carcinogenesis.

METHODS
- Fifty-six cervical biopsy specimens including 10 normal cervical mucosa, 7 koilocytosis, 20 CIN1, 13 CIN2, and 6 CIN3/carcinoma in situ (CIS) were collected from the pathology files at Thomas Jefferson University Hospital.
- All diagnoses were confirmed by at least two experienced pathologists. Immunohistochemical staining for ALDH1 was performed following a previously published protocol. Any cytoplasmic staining of ALDH1 in the epithelial cells was considered positive. Positive and negative controls were used in each study.

RESULTS

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Distribution of ALDH1 in squamous epithelium</th>
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<tbody>
<tr>
<td></td>
<td>negative</td>
</tr>
<tr>
<td>Normal</td>
<td>10</td>
</tr>
<tr>
<td>Koilocytosis</td>
<td>5</td>
</tr>
<tr>
<td>CIN1</td>
<td>9</td>
</tr>
<tr>
<td>CIN2</td>
<td>2</td>
</tr>
<tr>
<td>CIN3/CIS</td>
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</table>

Table 1: The summary of the expression and distribution of ALDH1 in normal and cervical intraepithelial neoplasia

CONCLUSIONS
- Cervical dysplasia show positive staining for ALDH1 compared to normal cervical mucosa.
- ALDH1+ cells distribution parallels the dysplastic cells in cervical dysplasia.
- CSC, as detected by ALDH1 expression, may play a role in the progression of cervical intraepithelial neoplasia and carcinogenesis.