MOTIVATION
Acute inflammation of the placenta is associated with an increased rate of perinatal morbidity and mortality. The standard diagnostic process is qualitative visual examination of Hematoxylin and Eosin (H&E) stained placenta histology slides. This process results in a high degree of variability in diagnosis, even among expert pathologist. Currently the diagnostic gold standard is consensus among expert pathologists based on qualitative observation. Our goal is to assemble an unsupervised method to quantify the degree of inflammation in placental tissue which is consistent with expert and lab results and reliable under inconsistent environmental factors such as staining techniques.

RESULTS
Amniotic fluid proteomic (AFMR) scores are strongly associated with histological grading of inflammatory PMNs in amnion, chorion, decidua, and in the umbilical cord. AFMR scores correlated with the total area of inflammatory PMNs (r=-.546), total area of inflammation vs. total area of tissue (r=0.546), and the number of inflammatory PMNs (r=0.505). Results were consistent across environmental variations such as stain aging and brand combinations. Because the method presented is unsupervised, the results are reliable and reproducible.

METHODS
1. Isolate the tissue by removing the background and red blood cells via color thresholding. This both normalizes and reduces the amount of data for further processing.

2. Apply the iterative threshold technique to isolate nuclei from the tissue. This novel thresholding technique is based upon experimental observations which indicate that the optimal threshold value is a function of the intensity after the nuclei are removed. Since the nuclei cannot be removed without first knowing the threshold, we developed a technique which starts with a necessarily low value and approaches the desired value with each iteration as the previously selected pixels are removed.

3. Classify nuclei based on morphological characteristics, e.g. size and shape, into two groups: inflammatory Polymorphonuclear Leukocytes (PMNs) and those which are not, such as connective tissue fibroblasts as well as chorionic and amnion epithelium.

4. Quantify results of the classification: number of inflammatory PMNs, area of the tissue and area of the inflammation.

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