

Claims

1. A method for analysing a sample obtained from a subject, comprising the steps of:
 - a) providing a spectrum produced by spectrally scanning the sample using a single element ATR infrared spectroscopy technique, the spectrum being an average spectrum over a substantial part of the sample;
 - b) identifying one or more tissue types in the sample according to the spectrum each such tissue type produces; wherein the identifying comprises a combination of steps of:
 - (i) assigning the spectrum to either a {non-dysplastic or high-grade-dysplastic or cancerous} classification or a {squamous} classification;
 - (ii) assigning a {non-dysplastic or high-grade-dysplastic or cancerous} spectrum to either an epithelial classification or a lamina propria classification;
 - (iii a) assigning an epithelial spectrum to either {a non-dysplastic} classification or {a high-grade-dysplastic or cancerous} classification;
 - (iii b) assigning a lamina propria spectrum to either a {non-dysplastic} classification or a {high-grade-dysplastic or cancerous} classification; and
 - c) determining the presence or absence of a specified disease and/or disease state depending on whether high-grade-dysplastic or cancerous tissue types are identified in the sample.
2. A method according to claim 1, wherein assigning the spectrum under step (i) to either the {non-dysplastic or high-grade-dysplastic or cancerous} classification or the {squamous} classification is on the basis of {1385-1235 and 1192-1130 cm^{-1} } spectral regions and/or the spectral region around 1153 cm^{-1} .
3. A method according to claim 1 or claim 2, wherein assigning a {non-dysplastic or high-grade-dysplastic or cancerous} spectrum under step (ii) to either the epithelial classification or the lamina propria classification is on the basis of the spectral region around 1570 cm^{-1} and/or a 1610-1465 cm^{-1} spectral region.
4. A method according to claim 3, wherein assigning an epithelial spectrum under step (iii a) to either the {non-dysplastic} classification or the {high-grade-dysplastic or

cancerous} classification is on the basis of a 1200-900 cm^{-1} spectral region, preferably a 1100-900 cm^{-1} spectral region, further preferably the spectral regions around 1082, 1043, and 974 cm^{-1} .

5. A method according to any preceding claim, wherein assigning a lamina propria spectrum under step (iii b) to either the {non-dysplastic} classification or the {high-grade-dysplastic or cancerous} classification is on the basis of {1290-1210 and 1130-870 cm^{-1} } spectral regions, preferably the spectral regions around 1221 and 1047 cm^{-1} .

6. A method according to any preceding claim, wherein the identifying further comprises combining classification results from two spectra, one from each side of the sample.

7. A method according to any preceding claim, wherein the sample is epithelial tissue from the esophagus.

8. A method according to any preceding claim, wherein the method also comprises the step of shifting or calibrating the spectra to take into account the hydration of the sample.

9. A method according to any preceding claim, wherein step b) is performed by comparing the spectrum to a reference data set.

10. A method according to claim 9, wherein the reference data set are spectra of samples with a known specified disease and/or disease state produced using a spectroscopy technique with microscopic resolution.

11. A method according to any preceding claim, wherein the sample comprises two or more constituent tissue types, including a predominant tissue type and at least one minority tissue type.