One system that meets the above needs is the pharma-informatics system described in PCT application serial no. PCT/US2006/016370 filed on April 28, 2006 and published as WO 2006/116718, the disclosure of which is herein incorporated by reference. While the system described in this application provides for many benefits, reliability of signal generation can be an issue under certain situations. For example, depending on how the pharmaceutical composition is ingested, the particular contents of the stomach can have a significant impact on how the identifier in the composition activates. For example, signal generation can be affected by the liquid with which a composition is ingested, e.g., water, juice, etc.

As such, of interest would be the development of an improved pharma-informatics system in which the activation of the identifier was highly controlled, such that the signal generated by the identifier would be independent of the particularly environment, e.g., stomach contents, the target site where activation is desired. The present invention provides, for the first time, such a capability.

SUMMARY

The present disclosure~~invention~~ provides for the controlled activation of ingestible identifiers, e.g., as may be incorporated into pharma-informatics enabled pharmaceutical compositions, as may be present in ingestible event markers, etc. Embodiments of the controlled activation identifiers of the invention provide for robust and reliable use despite the presence of variable conditions in the applications in which they are employed, e.g., inadequate degradation of a pharmaceutical carrier, variations in the environment of the target site of interest, etc.

The controlled activation identifiers of the invention are identifiers that are activated upon association with a target site of a body. The controlled activation identifier is one that is activated by the presence of a predetermined specific stimulus at the target site, e.g., liquid (wetting), time, pH, ionic strength, conductivity, presence of biological molecules (e.g., specific proteins or enzymes that are present in the stomach, small intestine, colon), blood, temperature, specific auxiliary agents (foods ingredients such as fat, salt, or sugar, or other pharmaceuticals whose co-presence is clinically relevant), bacteria in the

stomach, pressure, light, etc. The predetermined specific stimulus is a known stimulus for which the controlled activation identifier is designed or configured to respond by activation. In certain embodiments, the signal generated by the identifier is independent of the environment of the target site, e.g., the nature of the fluid at the target site.

The controlled activation identifier includes a controlled activation element that may include one or more components, where the one or more components provide for the desired controlled activation in response to the presence of the predetermined specific stimulus at the target site. In certain embodiments, the controlled activation identifier includes a dried conductive medium precursor composition (e.g., a dried salt composition) as the controlled activation element, where this element, upon contact with a fluid (such as stomach fluid), produces a conductive medium resulting in activation of the power source and production of an identifying signal. The presence of the dried conductive medium precursor in the power source provides for a number of advantages, including the ability to obtain reliable activation of the identifier despite variations in the environment of the target site (e.g., variations in terms of stomach content composition), where activation of the identifier is desired. In yet other embodiments, the controlled activation identifier includes a barrier as the controlled activation element, e.g., in the form of a protective film, that is configured to provide for activation of the identifier upon association with the target site of interest. Other types of controlled activation elements include two or more components, such as a dried conductive medium and a barrier, e.g., as described in more detail below.

The broadcasted signal from the identifier may be received by another device, e.g., a receiver, either inside or near the body, which may then record that the identifier, e.g., one that is associated with one or more active agents and pharmaceutical composition, has in fact reached the target site.

In one aspect of the present disclosure, there is provided a battery smaller than 10 mm^3 comprising two materials with dissimilar electrochemical activities and a dried conductive medium precursor, wherein said battery is activated upon contact with a physiological fluid.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 shows diagrammatically the effects of the pill ingestion where some of the pill has eroded away.

FIG. 2 provides a similar arrangement to **FIG. 1**, with a coil rather than two electrodes as the output.