Table I: Examples of Cell-to-cell communication events related to the cervix and its functions

<table>
<thead>
<tr>
<th>Organ emitting messenger</th>
<th>Cells emitting the messenger</th>
<th>Messenger(s)</th>
<th>Receiving Organ</th>
<th>Receiving Cells</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovary</td>
<td>Granulosa Cells</td>
<td>Estrogenic hormones</td>
<td>Cervix</td>
<td>S Cells</td>
<td>Secrete S Mucus</td>
</tr>
<tr>
<td>Cervix</td>
<td>S Cells</td>
<td>S mucus</td>
<td>Vulva</td>
<td>Mechano-receptor cells</td>
<td>Mucus symptom</td>
</tr>
<tr>
<td>Vulva</td>
<td>Mechano-receptor cells</td>
<td>Neurotransmitters</td>
<td>Brain</td>
<td>Several afferent nerve cells</td>
<td>Awareness of mucus symptom</td>
</tr>
<tr>
<td>Cervix</td>
<td>S cells</td>
<td>S mucus micelles and their vibrations</td>
<td>Cervix</td>
<td>Sperm cells</td>
<td>Direct and augment sperm propagation</td>
</tr>
<tr>
<td>Isthmus</td>
<td>Z cells</td>
<td>Mucolytic enzyme(s)</td>
<td>Mucus</td>
<td>Macrophages</td>
<td>Give space for L &amp; S mucus facilitate mucus symptom and lymph node sign</td>
</tr>
</tbody>
</table>
| Cervix                   | Macrophages                 | Antigenic polypeptides | Immune System   | Lymphocytes    | 1. Fight bacteria or viruses 
2. Normal lymph node sign |
| Cervix                   | Developing S Cells           | Cadherins     | Cervix          | Developing S cells | Morphologic ordering of cells |

Helpful Definitions to Table I:

Antigenic polypeptides: Proteins that serve as messengers
Cadherins:
Granulosa Cells:
Lymphocytes:
Machrophages:
Mechanoreceptor Cells:
Micelles:
Morphologic ordering of cells:
Mucolytic enzymes:
Send signals to the brain that tell the woman mucus is present
Molecular bundles
Enzymes in the cervical canal
Odeblad releases new study: Cell-to-cell communication

by Erik Odeblad, M.D. & Mikaela Menarguez, Pharacist

Every organ in the body is made up of millions of cells. They are present in the blood vessels, lymph vessels, nerves and in the connective tissue. There are also the cells specific for the particular organ we consider, e.g. the secretary cells of the uterine cervix. To maintain a proper function, these cells must communicate with each other and with cells in other organs. For example, the granulosa cells in the ovarian follicle send messengers (estrogonic hormones) to the S mucus producing cells in the cervix. In turn, these cells send a message (the S mucus) reaching the vulva, where the mucus is perceived by a system of mechanoreceptor cells. These cells send signals to the brain via sensory pathways and the woman becomes aware of her capacity to conceive, she feels the mucus symptom. Table I (on page 3) gives in condensed form, this information as well as some other important intercellular signalling circuits.

The S mucus informs the sperm cells that they can propagate easily and rapidly through the cervix. This message is actually contained in the molecular structure of the mucus itself and its vibrations of the molecular bundles (the micelles).

Like other organs in the body the cervix is constantly patrolled by scavenger cells, called phagocytes, which ingest and degrade the invaders. The degradation products are exposed to lymphocytes which become activated, multiply and dispense specific messengers (interleukins) which mobilize a whole army of new lymphocytes and leucocytes conquering the invaders.

Also, other communication systems exist within the cervix. When new crypts are formed, e.g. during adolescence and when fertility returns after childbirth, the newly formed secretary cells are kept together and properly arranged with the aid of messengers, proteins called cadherins. These compounds join secreting cells of the same kind to form the distinct secreting units we call crypts. Otherwise the cervix would contain a chaotic mixture of unordered secreting cells and fertility would be considerably impaired.

We know presently that the various mucus types are, to some extent, broken down in the cervical canal by enzymes, called mucolytic enzymes. These substances probably emanate from glands in the isthmus region, a narrow region located between the cervix and the corpus of the uterus. The mucolysis is particularly important just at the beginning of the fertile phase of the cycle when the highly viscous G mucus must disappear and give space for the L and S mucus types. The residues of partially broken-down G mucus may then be ingested by phagocytes.

As already mentioned, the phagocytes have the inherent property to present the material they have caught to lymphocytes. These may now start to react and multiply, especially in the lymph nodes. Within some days, and most often just before or at ovulation, the swollen lymph node in the groin may give rise to the lymph node sign. There are several other factors involved in the lymph node sign however, and all these will be discussed in a forthcoming paper.

All examples of cell-to-cell interactions we have mentioned are also exposed in Table I. These examples may indicate that intercellular communication is essential for the structural development and maintenance and for the function within the area of human reproduction (as well as many other fields of human biology and pathology). Aspects of cell-to-cell communication help us to look at and understand many processes involved in human reproduction in a new way and perhaps explain previously unclear problems in Natural Family Planning.

See Table I on next page for further details.

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