CHAPTER 3

White Blood Cell Behavior as an Organizational Metaphor

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Lymphocytic Behavior Within the Immune System as an Organizational Metaphor

Organizations are complex and the use of metaphors is valuable in understanding the nuances of organizational structure, along with the positives and negatives of each structure. The relationship between theory and metaphor is strong, as "all theory is metaphor" (Morgan, 2006, p. 5). The immune system protects the host from infection and is a complex adaptive system of identification, internal communication, and defense against an infective agent. The immune system recognizes threats versus non-threats to the host, both internal and external threats. Organizations through their structure are typically prepared for assault. These structures protect them from external threats (e.g. changing economic environment) and internal threats (e.g. malevolent employees). Just as the role of the immune system is to help maintain physical homeostasis, the organizational metaphor of the immune system can help to explain the need for appropriate

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organizational structure, internal communication, and response strategies to maintain corporate homeostasis.

The Nature of the Immune System

The immune system is a complex system of cells and organs that function as an identification system with the simple function of recognizing dysfunctional cells within the host (infectious self), and recognizing exogenous infective microorganisms, such as viruses, bacteria, and other parasites. "The interaction among the immune system and several other systems and organs allows the regulation of the body, guaranteeing its stable functioning" (Muhamad and Deris, 2013, p. 101). The immune system is a complex adaptive system, not only allowing for immediate reaction to something identified as foreign, but demonstrating continual learning to identify and remember unknown (foreign) antigens.

The specificity of the immune system is in keeping with Scripture. Numerous passages speak to the specificity of God, and of His creation.

> Who has measured the waters in the hollow of his hand and marked off the heavens with a span, enclosed the dust of the earth in a measure and weighed the mountains in scales and the hills in a balance? (Isaiah 40:12, English Standard Version)

Psalm 104 also offers a very specific view of creation (setting the earth on its foundations, setting boundaries between mountains and valleys, providing water from the hills, allowing plants to be cultivated, creating lunar seasons), lauding God as the creator and sustainer of the world. Some have viewed the Psalmic strophes with the seven days of creation (Boice, 1996), while others have viewed the specificity as an affirmation of the Biblical flood (Barrick, 2018). Regardless, the Psalm speaks to the intricacies of the earth, mountains, hills, springs, trees, sun and moon, the sea, and that all these systems look to God as their creator. In similar fashion, the immune system is a complex system with multiple simultaneous interactions required for our homeostasis.

The immune system is activated, therefore, when recognition of a pathogen exceeds a certain preset threshold. The classification of these immune system cells is broken into role. For example, neutrophils target bacteria and fungi, while eosinophils target larger parasites and modulate allergic responses, and basophils release histamine for inflammatory

responses. Lymphocytes, a subset of white blood cells, are broken into further sub-types including B cells, CD4+ helper T cells, CD8+ cytotoxic T cells, suppressor T cells (which return the immune system to a basal state after infection preventing autoimmunity), and natural killer cells. The role of these T lymphocytes is to identify and destroy infective material (pathogen) beyond neutrophils or eosinophils. B lymphocytes, known as memory cells, are where successful responses to foreign antigens are remembered. This memory allows for rapid response to repeated attack by the same pathogen.

An activated immune system conducts six main processes in a sequential pattern. In summary, pieces (peptides) of the antigen once joined to the body of antigen presenting cell (APC), identified and then displayed on the surface of the major histocompatibility complex (MHC) of that APC; T lymphocytes activated by this display divide and secrete lymphokines, thereby mobilizing the rest of the immune system; B lymphocytes with specificity to that peptide respond to the lymphokines; these activated B cells differentiate into plasma cells, secreting antibodies to the antigen; the antibodies bind the antigen neutralizing it or; the antibodies bind to the antigen destroying it by the use of complement enzymes or scavenging cells. After the pathogen is dealt with, the immune system returns to its resting or basal state.

Dooley (1997) notes that complex adaptive systems (CAS) are self-organizing and learning, and this model has its roots in the biological sciences. Complex adaptive systems comprise three elements: the organic (adaption to the environment), the cognitive (interpreting reality and enacting decisions), and organismic (competing/cooperating for resources) (Dooley, 1997). For this system to be effective, however, it must operate under a system of clearly prescribed rules. "Rules are defined as shared understandings that refer to enforced prescriptions about what actions are required, prohibited, or permitted" (Janssen, 2005, p. 16). These rules prevent the immune system from attacking everything seen, yet these rules can fail. Examples of the immune system gone awry include rheumatoid arthritis, systemic lupus erythematosus, and even diabetes mellitus (Huizinga, 2002). Therefore, this protection comes with a cost: the immune system may inappropriately attack the host, destroying healthy tissue or organs, known as the "autoimmune" response. Importantly, a pathogen, while normally exogenous, is not always exogenous. If the pathogen closely resembles or mimics the behavior of host cells, it may not be detected and destroyed. Cancer cells, for example, are normal cells that

change into abnormal cells and multiply without undergoing apoptosis. Cancer cells are constantly produced within the body and should be destroyed upon identification, yet we continue to treat cancers of various types as these individual malignant cells gather together to form a consolidated tumor, or crowd out normal cells (an example of which is a lymphoma). Pathogens, on the other hand, can evade lymphocytic attack by "hiding" in cells (e.g. herpes simplex viruses) or by constantly mutating (e.g. human immunodeficiency virus or malaria).

In summary, the immune system is a Complex Adaptive System, which recognizes both dysfunctional cells within the host and infective microorganisms. As a CAS, it adapts to the environment, enacts decisions, and competes or cooperates for resources (Dooley, 1997). Scripture speaks to the interconnectedness of the bodily systems, and the immune system is just one key system needed for homeostasis. Homeostasis is the body's ability to maintain a constant environment even in response to external changes. Romans 12:4–5 states: "For as in one body we have many members, and the members do not all have the same function, so we, though many, are one body in Christ, and individually members one of another" (ESV). As discussed below, organizations require systems needed to maintain organizational homeostasis and these systems require both specificity and interconnectedness.

Lymphocytic Behavior as Metaphor

The Circulating APC and Organizational Boundaries

For an organization, creating boundaries and core competencies is critical. "Defining an environment as what lies outside an organizational boundary involves making decisions about inclusion and exclusion" (Hatch & Cunliffe, 2013, p. 58). Globalization has made defining organizational boundaries more difficult, as no organization is immune to global forces (Javidan, Dorfman, & House, 2006), yet organizations need to decide what they will and will not do. For example, pharmaceutical organizations need to decide which therapeutic areas they will specialize in and which markets they sell to and, as importantly, which areas they will not specialize in and which markets they will not sell to. Similarly, the role of the circulating APC is to be alert to the presence of foreign antigens, yet there are boundaries to the APC. It only exists within the vascular and lymph compartments; therefore, it can only analyze risk within these boundaries.

Organizational boundaries can be communicated through organizational vision. "To be effective, leaders must be able to motivate and direct followers towards group or organizational goals, mission, or vision, and be able to maintain stability and group harmony even when acting as agents of change" (van Knippenberg & Hogg, 2003, p. 244). This clarifying of organizational role or vision allows followers to understand their role within the organization, not only to move the organization forward but to protect it against threat. While external boundaries which outline organizational core competencies are critical, there must be internal holes within the organization which strengthen it. Boundary spanners (within the organization) promote organizational ability to deal with challenges (Levina & Vaast, 2005). Cross-functional team leaders promote communication flow between two departments, an example of which would be information technology leads who work with the end users to understand departmental threats and the information technology programming who would program the appropriate countermeasure. Similarly, the APC can cross between the vascular and lymph compartments.

Organizations must create a system of monitoring error; create standard operating procedures (SOPs) and quality systems to ensure the quality of product produced is consistent. A fast food enterprise is an example where these SOPs and quality systems ensure that the product produced is not only safe but consistent amongst various stores and geographies. This is analogous to the circulating APC responds to foreign antigens but ignores normally operating cells.

Presentation of Foreign Antigen to the T Lymphocyte Represents Organizational Safety Systems

The T lymphocyte confirms the presence of a foreign antigen before secreting lymphokines. It internalizes the peptide, identifies it and if found to be foreign, the lymphocyte displays the peptide on the surface of the MHC. Organizations must also have definable production processes that ensure not only speed but safety. Cutting time from production to sales is an important variable for organizations, however improperly constructed product results in recalls and returns to the factory. General Motors had recalled 1.5 million cars for a steering defect and 2.6 million cars for faulty air bag switches. As a result, they have implemented a "Speak Up for Safety" program allowing employees to provide input on safety (General Motors, 2014). Organizations must have qualified external vendors before

bringing in raw materials. For example, in 2011, approximately one-third of children's toys made in China contained heavy metals, and one in ten displayed excessive levels of lead. North American stores selling these products needed a safety system, which would have prevented these products from entering the point of sale system (Nag, Han, & Dongqing, 2014).

In similar fashion to how foreign proteins are identified, organizations should have a mechanism for ensuring speedy but reliable product manufacturing and by which employees can provide safety input into the manufacturing process, thereby increasing their organizational pool of T lymphocytes.

Lymphokine Secretion Is Similar to Organizational Communication

Organizations must have a communication structure that allows management to marshal resources to correct error. "Communicators can make a series of strategic decisions about attributes that increase the probability of communication reaching internal stakeholders" (Welch, 2012, p. 248). The key attributes of appropriate communication pathways include controllability, dissemination, and usability. Welch (2012) goes on to note that organizations should adopt a stakeholder approach, keeping an employee-centric communication basis, while being able to control the communication flow. Hatch and Cunliffe (2013) note that an open office structure increases visibility, openness, and accessibility amongst team members. Structural holes within organizations are critical factors for effective team performance and teamwork (Zou & Ingram, 2013). This is like secreted lymphokines, which alert memory cells (B lymphocytes) to the existence of a pathogen, determining if a memory to this pathogen already exists, and thereby speeding immune response.

Yet the organization must allow the appropriate level of communication relative to the threat. For example, electronic *intranet* postings are appropriate for ongoing production concerns, while face-to-face communication is the most appropriate for the utmost urgent production concern. For example, Kaizen, an inexpensive commonsense approach to management, emphasizes the reduction of production waste (Mano, Akoten, Yoshino, & Sonobe, 2013). Included in Kaizen methodology are input methods from the employees to management suggesting how to decrease error and waste within a production system.

B Lymphocyte Activation Portrays Organizational Threat Response

Organizational response to internal errors or external threats must correspond to size of the specific error/threat. In the immune system, pathogen specific memory B cells are activated by lymphokines secreted by T lymphocytes. Successful responses to previous foreign antigens are remembered and the exact same response is enacted allowing for rapid destruction of the pathogen. An organizational error example can include scheduling errors resulting in decreasing production output. Using an artificial immune system (AIS), Muhamad and Deris (2013) demonstrated that production schedules obtained by using an AIS model are more robust than other methodologies, and like the natural immune system, increasing the number of antigens (a job sequence within a piece of equipment) improves the optimal scheduling plan. "Scheduling is an area demanding the application of efficient methods to tackle the combinatorial explosion of the results in real-world applications" (Muhamad & Deris, 2013). When the response to the error involves communication, the organization must remove extraneous departments from becoming involved in the response. Extraneous involvement slows the appropriate response to the threat, potentially keeps the image of the threat alive through reechoed conversations, and can decrease organizational morale without providing the specific learning opportunity for the organization.

Organizations must also have a systematic method of destroying or neutralizing the error or threat. A systematic example includes corrective action conducted under a Corrective and Preventative Action (CAPA) plan to stop the error or threat. CAPAs, which result in new SOPs, can be considered organizational rules. Cunningham and Geller (2011) selected the nine most common patient safety events in a private health care institution, and applied behavior change techniques including corrective-action communication, individual and group behavior-based feedback, and positive recognition strategies. In the two months following intervention implementation, selected patient-safety events decreased below average basal levels. This is like rapid destruction of the pathogen (patient safety event) by B cell activation (intervention strategies).

Importantly, when new organizational rules are created, the ability for the organization to have adoption of the rule is dependent on social capital within the organization (Janssen, 2005). The followers must trust that

the organizational rules positively affect them, or they will not be implemented.

> Rules for collective choice will be selected when there is a sufficient level of social capital. In a population of distrust, selfishness, and individualism, cooperative arrangements are unlikely to emerge, although rules might be selected and imposed by a ruling clique and give that clique substantial advantage over others. (Janssen, 2005, p. 20)

Followers need to understand the significance of the error or threat not only to their work environment but to the organization overall. Decreased production results in decreased profit and corporate instability.

The Pathogen Being Committed to Memory Is Similar to Organizational Critical Incident Response

Organizational memory must occur to allow for similar successful responses to organizational threats or errors. The use of critical incident reports, for example, allows for corporate memory to occur. Critical incident reports describe the situation, mitigating factors, and successful conclusion of the event. This allows for removal of the error/threat for the future, or the same successful response. Importantly, this report becomes part of corporate memory. In similar fashion, new B lymphocyte selectivity occurs to that specific antigen once the threat is neutralized or destroyed. This allows for a rapid response should the antigen occur again. A good example would be vaccinations, which induce an immunologic response and memory to the pathogen.

Fawcett, Fawcett, Cooper, and Daynes (2014) used critical incident techniques to examine customer experiences and explore phenomenological and systems design aspects associated with that experience. This came from the understanding that a supply chain is only as strong as the weakest link, and that link is customer experience with a product. They concluded that critical incident technique improved customer experience, even if an improvement in corporate performance could not be measured (Fawcett et al. 2014).

Table 3.1 is a summary of the immune system metaphor as it applies to both the organization and to organizational design for consultants.

The question remains as to what happens if the immune system fails? If the immune system allows for pathogenic growth, disease occurs in the

Table 3.1 The immune system as applied to organizational design

Immune system aspect	*For organizations*	*For the immune system*
The circulating APC	The organization has operational boundaries and is prepared for assembly errors by the creation of SOPs and quality systems	The circulating APC is alert to the presence of foreign antigen
Presentation of antigen by the MHC to the T lymphocyte	The organization must have a reliable system of reaction to production error with definable identification processes	The T lymphocyte confirms the presence of antigen before secreting lymphokines
Lymphokine secretion to B lymphocytes	The organization must have a communication structure that allows management to marshal resources to correct error	Secreted lymphokines alert memory cells to pathogen
B lymphocyte activation	Organizational response must correspond to size of error/threat	Pathogen specific memory B cells are activated by lymphokines
Pathogen neutralization/ destruction	Organizational corrective action under CAPA stops the error/threat	Antibodies neutralize/ destroy antigen
Pathogen committed to memory	Organizational preventative action under CAPA prevents error/threat recurrence	New B lymphocyte selectivity occurs to the pathogen

Source: Author's creation

host. For organizations, the analogy is when leaders do not respond to a threat, despite all the safeguards built into the system. A lack of action results in corporate weakness, and if left unchecked, results in corporate death. However, the "inaction inertia" is real, and a psychological response to a missed first opportunity (Tykocinski & Ortmann, 2011). Leaders make inappropriate decisions to the same but lesser stimuli when presented a second time. This invokes our understanding of the immune threshold, where only stimuli of a certain magnitude are responded to. The organization should recognize the ramifications of non-action and be encouraged to enact a strategy for minimum thresholds before a corporate immune response occurs.

If the immune system is overactive, autoimmune disease, such as psoriasis occurs, requiring the introduction of an exogenous immunosuppressant to decrease the immune system's response to a particular threat (Papp et al., 2008). For organizations, an overreaction to threats, corporate silos

Table 3.2 The implications of a non-functional immune system as applied to organizational structure

Immune system aspect	*For organizations*	*For the immune system*
Disease caused by a pathogen	Inaction of corporate leaders to respond to the threat	Inaction of the immune system allowing for the presence of disease
Autoimmune disease	Corporate silos, infighting, malevolent employees	Immune system inappropriately activates destroying the host

Source: Author's creation

vying for power, and malevolent employees causing turbulence within the company would be like autoimmune disease. For organizations without a designed strategy with the intent of decreasing the level of inappropriate reaction, forcing open communication between silos, and removing non-productive employees using appropriate performance metrics, and external "immunosuppressant" will be required. That external force may be the insertion of a new CEO or a wholesale change of senior leadership.

Table 3.2 provides a summary of the immune system metaphor on both sides of failure: the presence of disease, or the presence of autoimmune disease.

Areas for Expansion of the Lymphocytic Behavior Metaphor

For the purposes of this metaphor, the organizational pathogens described are limited to external threats or internal employee action. However, there are numerous organizational pathogens that can be understood by this metaphor. Requests for increased internal resource allocation creates conflict and rival unit requests for resources (Birkinshaw & Ridderstråle, 1999), allowing for the creation of autoimmunity within the organization. Inappropriate resource allocation weakens the company to external attack and takeover by rival companies, invoking the image of autoimmunity resulting in death. The use of stem cells (undifferentiated immature cells) to strengthen the immune system correlates to the infusion of corporate interns within an organization to increase excitement (Page, 2012). Immune system ablation by chemotherapy or radiation therapy to destroy tumors correlates to corporations removing entire non-productive divisions from their organizations. The lymphocytic behavior metaphor has room for further expansion, and the potential to invoke new metaphors within micro aspects of lymphocyte behavior.

Conclusion

"Change is an inherent characteristic of most organizations…" (Hatch & Cunliffe, 2013, p. 289). The immune system, while a complex adaptive system itself, can be used to understand and plan for corporate response to threats and errors. Specifically, the metaphor of lymphocyte behavior brings together the understanding of threat identification, an appropriate response to the level of the threat, creation of corporate memory to that response, and a return to a basal state after the threat. Failure of the immune system results in disease and a negative impact on corporate performance, whereas overstimulation of the immune system results in autoimmune disease with a similar outcome on corporate performance. This metaphor can be expanded in the future to explain micro aspects of the immune system in relation to organizational design and performance. This organizational metaphor is in keeping with our understanding of Scripture and its specificity to the world. In particular, Psalm 104 "…includes the totality of Yahweh's relationship to his world, both as creator and sustainer" (Barker, 1986, p. 80).

> The Psalm gives an interpretation to the many voices of nature and sings sweetly both of creation and providence. The poem contains a complete cosmos: sea and land, cloud and sunlight, plant and animal, light and darkness, life and death, are all proved to be expressive of the presence of the Lord. (Spurgeon, 1885)

As Christian leaders, we can use this organizational metaphor, both to better understand biologic behavior, organizational behavior, and to marvel at the specificity of creation.

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