

Scientist Identifies Signaling Underlying Organ and Limb Regeneration – A Spiritual Insight

By MATSATI - June 19, 2021



Wound healing is one of the essential aspects of regeneration of the tissues and bones which is necessary for life. Recently a paper was published which reports a study on salamanders (axolotl) whose whole limbs are capable of regeneration after amputation and while also being exposed to non-sterile environments. This is significant as our current understanding in regeneration, we know that a balanced inflammatory response is key as inflammation is essential for regeneration where excessive inflammation will result in tissue destruction and inefficiencies in the prevention of infection, etc. One of the key aspects of this research is to understand the differences in mammal and amphibian regeneration, and how ultimately what is learned may lead to facilitating this same tissue enhanced repair in mammals using pharmaceutical therapies.

References

1. Ryan J. Debuque et al, ***Distinct toll-like receptor signaling in the salamander response to tissue damage***, *Developmental Dynamics* (2021). DOI: [10.1002/dvdy.340](https://doi.org/10.1002/dvdy.340)

This study, led by a team of scientists at the MDI Biological Laboratory in Bar Harbor Maine, unraveled some of the differences in molecular signaling that promotes regeneration in salamanders. The study compared the salamander signals to that of the adult mouse, which has a limited regenerative ability. Mice, as is typical for mammals, generally form a scar at the site of a bodily injury. Scarring creates a physical barrier to regeneration. So the idea that led to this research was to discover why the salamander does not have scarring and why the salamander does not respond to injury in the same way that the mouse and other mammals do. These Axolotls salamanders do not scar which allows regeneration to take place. If we would be able to prevent scarring in humans, we could significantly enhance quality of life. Take for example someone who has had damage to feet, legs, or arms, one

could perform an amputation and the body could regenerate an entirely new arm or leg. This is not limited to the appendages, as the axolotl salamander can regenerate almost any body part, including the heart, brain, lungs, ovaries, spinal cord, skin, tail, and more.

The research paper reports on comparisons of the immune cells called macrophages in the salamander to those of mice with the goal of identifying the cells that promote regeneration. Earlier studies by this team of researchers revealed that when the macrophages are depleted, scarring forms instead of regeneration in salamanders. One interesting discovery when salamanders and mice were exposed to bacteria, fungi, and viruses the macrophages responded the same way between amphibians and mammals. When exposed to injury the macrophage signaling promoted the growth of new tissue whereas in the mouse it promoted scarring. Specifically, the signaling response of a class of proteins known as toll-like receptors (TRLs) are the suspected pathway which allows macrophages to recognize a threat of infection or tissue injury. This protein helps the macrophages to respond appropriately in amphibians, such as providing a pro-inflammatory response in amphibians which leads to regeneration. It is at this point in immune response in which there is an unexpectedly divergent behavior comparing the salamander to the mouse. This new finding provides a new research opportunity to study the underlying mechanisms governing regeneration in salamanders. This research is foundational to understanding and developing regeneration technologies (Pharmaceuticals and therapies) that could lead to regeneration in humans. Gaining these new insights places us closer to understanding the exact mechanism of regeneration in salamanders and brings us closer to developing methods for reproducing this in mammals (humans and animals). The continued research at MDI Biological Laboratory is to map out the critical nodes in TLR signaling pathways that regulate this regeneration vs. scarring behavior.

The Spiritual Insights that we receive from this type of research is related to this biological pathway for regeneration. This reminds me of Parashat Reah ([Devarim / Deuteronomy 11:26-28](#)).

ספר דברים פרק יא

כֹּה רָאָה אֲנִי נֹתֵן לְפָנֵיכֶם הַיּוֹם בְּרָכָה וּקְלָלָה: כִּי אֶת־הַבְּרָכָה אֲשֶׁר תִּשְׁמָעוּ
אֶל־מִצְוֹת יְהוָה אֱלֹהֵיכֶם אֲשֶׁר אֲנִי מֵצִיָּה אִתְּכֶם הַיּוֹם: כִּי וְהַקְלָלָה אִם־לֹא תִשְׁמָעוּ
אֶל־מִצְוֹת יְהוָה אֱלֹהֵיכֶם וְסָרְתֶּם מִן־הַדֶּרֶךְ אֲשֶׁר אֲנִי מֵצִיָּה אִתְּכֶם הַיּוֹם לְלֶכֶת
אַחֲרֵי אֱלֹהִים אֲחֵרִים אֲשֶׁר לֹא־יְדַעְתֶּם:

DEUTERONOMY 11:26–28

11:26 "SEE, I AM SETTING BEFORE YOU TODAY A BLESSING AND A CURSE: 11:27 THE BLESSING, IF YOU LISTEN TO THE COMMANDMENTS OF THE LORD YOUR GOD, WHICH I AM COMMANDING YOU TODAY; 11:28 AND THE CURSE, IF YOU DO NOT LISTEN TO THE COMMANDMENTS OF THE LORD YOUR GOD, BUT TURN ASIDE FROM THE WAY WHICH I AM COMMANDING YOU TODAY, BY FOLLOWING OTHER GODS WHICH YOU HAVE NOT KNOWN. (NASB)

Here Moshe says רָאָה (see) I am setting before you (אֲנִי נֹתֵן לְפָנֶיךָ) today (הַיּוֹם) a blessing and a curse (בְּרָכָה וּקְלָלָה). He goes on to describe what he means saying, אֶת־הַבְּרָכָה אֲשֶׁר תִּשְׁמְעוּ אֶת־מִצְוֹת יְהוָה אֱלֹהֵיכֶם אֲשֶׁר אֲנִי מְצַוְהָ אֵתְכֶם הַיּוֹם: וְהַקְלָלָה אִם־לֹא תִשְׁמְעוּ אֶל־מִצְוֹת יְהוָה אֱלֹהֵיכֶם *"the blessing, if you listen to the commandments of the Lord your God, which I am commanding you today; and the curse, if you do not listen to the commandments of the Lord your God."* When we lay the scientific research down alongside these scriptures, we draw out the idea of a mechanistic approach. (Note this is how some interpret these verses.) We note also how this remains today a valid warning וְסִרְתֶּם מִן־הַדֶּרֶךְ אֲשֶׁר אֲנִי מְצַוְהָ לֹא־יִדְעֻתֶם אֶתְכֶם הַיּוֹם לִלְכֹּת אַחֲרֵי אֱלֹהִים אֲחֵרִים אֲשֶׁר לֹא־יִדְעֻתֶם to not turn from the way of God to follow after other gods. As we read according to the Torah, we obtain God's blessing (בְּרָכָה) when we obey His holy Word. Our decision to obey manifests the blessed state of walking before the Divine Presence. Do these verses draw out the idea of man earning his salvation by working his way into heaven? The modern theologies today would suggest this approach to these Scriptures. I have heard it taught that God let's down a chain of 613 commands and man is trying to climb his way up into heaven. This is an example taken right out of modern theology 101, and is totally a biblical misconception (Error in theology)! Fortunately for us, this is not what Moshe is teaching and the Scriptures make this clear. Moshe is speaking of how we are to live as being a holy people who have been separated as an am segola (treasured people) by the power of God. What Moshe is warning us about is how we are to live our lives here on earth, sanctifying our lives through the choices we make to always set the Lord God of Israel before us and it is in this way that the path of true blessing (בְּרָכָה) comes. On the other hand, the curse (וּקְלָלָה) comes when we close our eyes and forget what the Lord God in heaven represents, life, truth, righteousness, and holiness, and what He wants for our lives. When we forget about who the Lord is, this invariably leads to idolatry of self, property (materialism), and seeking other gods. We know what the outcome is when we truly seek the Lord (בְּרָכָה, blessing) as opposed to turning from God and His ways (וּקְלָלָה, curses). The blessing and the curses spoken of here by Moshe comes from our own inward decision making and choices which are influenced by the presence of God in our lives. When we choose to set our feet upon the path God intends for our lives according to the Scriptures, the Lord God Almighty establishes the path we have chosen. This is facilitated by our dwelling in God's presence through faith and living by that faith. This is why we read David and Solomon saying what they do according to [Tehillim / Psalms 16:5](#) and [Mishley / Proverbs 16:9](#).

ספר תהילים פרק טז

ה' יְהוָה מִנְת־חֶלְקִי וְכוֹסִי אֶתֶּה תּוֹמִיךָ גּוֹרְלִי

TEHILLIM / PSALMS 16:5

(16:5 THE LORD IS THE PORTION OF MY INHERITANCE AND MY CUP; YOU SUPPORT MY LOT. (NASB))

ספר משלי פרק א

ט לב אָדָם יַחְשָׁב דַּרְכּוֹ וַיהוָה יְכִין צִעְדּוֹ

Proverbs TEHILLIM / PSALMS 16:9

16:9 THE MIND OF MAN PLANS HIS WAY, BUT THE LORD DIRECTS

HIS STEPS. (NASB)

David writes that God is his portion-possession (חֵן-תְּלִקִּי), his cup (כִּסְיִי), and He takes hold of his lot (אֶתְּהָ תוֹמִיךְ גּוֹרְלִי). This suggests something about our relationship with God, He is significantly involved in our lives and God Himself is our possession. Not only this, His taking hold of our lot suggests the Lord God makes the outcome of our situations in life work out according to His will. We just have to trust in Him! Notice how the NT text describes this in the way in which the disciples chose a 12th member according to Acts 1:12-26 as Matthias was chosen by lot to replace Judas. This game of chance is believed to be guided by God based upon these Scriptures.

We note what Jeremiah said in *Jeremiah 42:10* *'If you will indeed stay in this land, then I will build you up and not tear you down, and I will plant you and not uproot you; for I will relent of the disaster that I have inflicted on you. 42:11 Do not be afraid of the king of Babylon, whom you are now fearing; do not be afraid of him,' declares the Lord, 'for I am with you to save you and rescue you from his hand. 42:12 I will also show you compassion, so that he will have compassion on you and restore you to your own soil. (NASB)* This speaks to the blessing (בְּרָכָה) that follows the one who trusts in the Lord by listening and obeying. Remember, trusting in God requires faith which is then followed through by one's actions. Notice how the Lord says through Jeremiah that we don't have to be afraid, He will cause our enemies to have compassion on us. So again this speaks of God's blessing (בְּרָכָה) as following us no matter where we go, as long as we are walking in God's will. In this case from Jeremiah, the people were told to trust in the Lord God Almighty and remain in the Land. Next let's look at what happens to those who choose not to walk in God's ways.

JEREMIAH 44:4-8

44:4 'YET I SENT YOU ALL MY SERVANTS THE PROPHETS, AGAIN AND AGAIN, SAYING, "OH, DO NOT DO THIS ABOMINABLE THING WHICH I HATE." 44:5 'BUT THEY DID NOT LISTEN OR INCLINE THEIR EARS TO TURN FROM THEIR WICKEDNESS, SO AS NOT TO BURN SACRIFICES TO OTHER GODS. 44:6 'THEREFORE MY WRATH AND MY ANGER WERE POURED OUT AND BURNED IN THE CITIES OF JUDAH AND IN THE STREETS OF JERUSALEM, SO THEY HAVE BECOME A RUIN AND A DESOLATION AS IT IS THIS DAY. 44:7 'NOW THEN THUS SAYS THE LORD GOD OF HOSTS, THE GOD OF ISRAEL, "WHY ARE YOU DOING GREAT HARM TO YOURSELVES, SO AS TO CUT OFF FROM YOU MAN AND WOMAN, CHILD AND INFANT, FROM AMONG JUDAH, LEAVING YOURSELVES WITHOUT REMNANT, 44:8 PROVOKING ME TO ANGER WITH THE WORKS OF YOUR HANDS, BURNING SACRIFICES TO OTHER GODS IN THE LAND OF EGYPT, WHERE YOU ARE ENTERING TO RESIDE, SO THAT YOU MIGHT BE CUT OFF AND BECOME A CURSE AND A REPROACH AMONG ALL THE NATIONS OF THE EARTH? 44:9 "HAVE YOU FORGOTTEN THE WICKEDNESS OF YOUR FATHERS,

**THE WICKEDNESS OF THE KINGS OF JUDAH, AND THE
WICKEDNESS OF THEIR WIVES, YOUR OWN WICKEDNESS, AND
THE WICKEDNESS OF YOUR WIVES, WHICH THEY COMMITTED IN
THE LAND OF JUDAH AND IN THE STREETS OF JERUSALEM?
(NASB)**

Notice how the Lord God explains through Jeremiah how He was calling His people to turn from their wicked ways. In this particular situation, the people of Judah were fleeing from Israel in the hope of getting away from the sword, the famine, and the plague. Their feeling however did not get them away from the consequences of their sin, they brought their sinful ways with them. Walking in wickedness literally leads to harm to self and those around us. We note that if the people had not gone to Egypt, God most likely would not have caused Babylon to come against this nation. **Jeremiah 44:30**, כֹּחַ וְזִמְתְּ לָכֶם הָאוֹת, נְאֻם־יְהוָה כִּי־פָקֵד אֶנִּי עֲלֵיכֶם בְּמָקוֹם הַזֶּה לְמַעַן תֵּדְעוּ כִּי קוֹם יְקוֹמוּ דְבָרִי עֲלֵיכֶם לְרָעָה: ל כָּהֵן אֶמֶר יְהוָה הֲנִי נֹתֵן אֶת־פְּרִעָה חֲפָרַע חֲלָר־מִצְרַיִם בְּיַד אֲיָלָיו וּבְיַד מִבְקָשָׁי נִפְשׁוּ כְּאֲשֶׁר נִתַּנְתִּי אֶת־צִדְקִיָּהוּ חֲלָר־יְהוּדָה בְּיַד 44:29 'This will be the sign to you,' declares the Lord, 'that I am going to punish you in this place, so that you may know that My words will surely stand against you for harm.' 44:30 "Thus says the Lord, 'Behold, I am going to give over Pharaoh Hophra king of Egypt to the hand of his enemies, to the hand of those who seek his life, just as I gave over Zedekiah king of Judah to the hand of Nebuchadnezzar king of Babylon, who was his enemy and was seeking his life.'" (NASB) We note again how the actions of one man, or a group of people, our choices can lead to the destruction of an entire nation. This destruction can come from within or from without. A modern day example may be found in the LGBTQ and liberal ideologies that are so prevalent today leading many to live in grievous sin before God calling evil good! As a result of this, the people of the USA and elsewhere are adopting socialism ideologies and have the desire to give all of their freedoms, rights, and liberties to the government in the name of socialism and truly believe this is the best choice and will succeed. If we note what Paul wrote in **Romans 1**, this foolishness is a great deception brought by God to those who reject His word and His ways! Because of this, people ignorantly and self deceptively disregard how all socialized governments have failed and the logic that this same thing will happen here in the USA as well if implemented in government! This is why what we are reading about in Jeremiah applies to us even today as truth, showing us how we are to draw near to the Lord in His word, trust in Him and His promises, and live our lives according to His Word. Doing so, God will work in the hearts and minds of our enemies and even increase and strengthen our own faith! On the other hand, turning from the ways of the Lord will lead to just the opposite, the curse (וּקְלָלָהּ). Note again what **Devarim / Deuteronomy 11:26** states, רָאָה אֲנִי, were the word לְפָנֶיכֶם means "before you" and this implies that we are being given a choice. We have the freedom of choice which works in conjunction with the revelation of God's Righteousness and Holiness, and His presence in our lives. This is where the concept of reward and punishment are revealed to us in the Scriptures. Note also the idea of reward is meaningless if God simply decreed who was to be redeemed and who was to be destroyed (i.e. Calvinism's idea of predestination). Each of us has a choice to make. This is why we read throughout the history of Israel how God always sent prophets and men of God to God's people and the nations (i.e. Jonah) calling people to repentance (Teshuvah) to turn to God and His holy ways, to believe the good news, to trust in God, etc. (**Mark 1:15, Acts 2:38, 2 Peter 3:9. Revelation 2:5**)

What these things speak to us concerning faith, righteousness, and the blessing and the curse (בְּרָכָה וּקְלָלָה) is related to God's sovereignty and our responsibility before God. Paul wrote in [Philippians 2:12-13](#) saying, "*Work out (κατεργάζεσθε) your own salvation with fear and trembling, for it is God who works in you (θεὸς γὰρ ἐστὶν ὁ ἐνεργῶν ἐν ὑμῖν), both to will and to work for his good pleasure.*" As we choose to believe and step out in faith, trusting in the Lord, He will strengthen us in our resolve, he will provide us with the strength to overcome this world just as Yeshua overcame this world. This is the promise of God in our lives when Yeshua said to obey him and to remain in him and to walk in God's ways of truth and life. The promise and the power of God is accomplished through faith in Yeshua by our Father sending His Holy Spirit into our lives who gives us strength to persevere in the midst of anything that comes our way in this life. (see [John 14:26](#) and [15:26](#)) In light of what the Torah states, the prophets in the Tanakh, and the NT text, the central command remains, to trust in the Lord, to obey His Word, and to walk in His ways, and the love and grace of God will be with us every step of the way through His Son Yeshua. We are told by the Lord God almighty according to Jeremiah that He will never leave us nor forsake us if we remain in faith trusting in the Lord and in Yeshua. Yeshua continues to call out to us according to the words in [Revelation 3:20](#) saying, "*Behold, I have stood at the door and knocked. If anyone hears my voice and opens the door, I will come in to him and eat with him, and he with me.*" The question is "*what are we going to do with this request?*" According to Moshe, we are to *שמעו תשמע בקול יהוה אלהיך* "*diligently listen to the voice of the Lord our God.*" ([Devarim / Deuteronomy 28:1](#)) If we believe in Yeshua, seek the presence of God in our lives, receive the Holy Spirit and walk in the footsteps of Yeshua, we will receive what is promised according to the Torah as Moshe said in [Devarim / Deuteronomy 28:1](#), *אִם־שָׁמַעַתְּ בְּקוֹל־יְהוָה אֱלֹהֶיךָ לְשָׁמֵר לַעֲשׂוֹת אֶת־כָּל־מִצְוֹתָיו אֲשֶׁר אָנֹכִי וְהָיָה אִם־שָׁמַעַתְּ בְּקוֹל־יְהוָה אֱלֹהֶיךָ לְשָׁמֵר לַעֲשׂוֹת אֶת־כָּל־מִצְוֹתָיו אֲשֶׁר אָנֹכִי* *"Now it shall be, if you diligently obey the Lord your God, being careful to do all His commandments which I command you today, the Lord your God will set you high above all the nations of the EARTH. (NASB)* These truths are derived from the Torah, just as we read according to [Devarim / Deuteronomy 18](#).

ספר דברים פרק יח

א וְהָיָה אִם־שָׁמַעַתְּ בְּקוֹל־יְהוָה אֱלֹהֶיךָ לְשָׁמֵר לַעֲשׂוֹת אֶת־כָּל־מִצְוֹתָיו אֲשֶׁר אָנֹכִי מִצְוֶה הַיּוֹם וְנִתְּנָךְ יְהוָה אֱלֹהֶיךָ עָלֶיךָ עַל־כָּל־גִּוִּי הָאָרֶץ: ב וּבָאוּ עֲלֶיךָ כָּל־הַבְּרָכּוֹת הָאֵלֶּה וְהַשִּׁיגְךָ כִּי תִשְׁמָע בְּקוֹל־יְהוָה אֱלֹהֶיךָ: ג בְּרוּךְ אַתָּה בְּעִיר וּבְכֹרֶךָ אַתָּה בַּשָּׂדֶה: ד בְּרוּךְ פְּרִי־בִטְנְךָ וּפְרִי־אֲדָמָתְךָ וּפְרִי־בְהֶמְתְּךָ שֶׁגָר אֲלֶיךָ וְעִשְׂתָּרֹת צֹאנְךָ: ה בְּרוּךְ טֶנְאֶךָ וּמִשְׁאֲרֹתֶיךָ: ו בְּרוּךְ אַתָּה בְּבָאֶךָ וּבְרוּךְ אַתָּה בְּצֵאתְךָ: ז יִתֵּן יְהוָה אֶת־אֵיבֶיךָ הַקָּדְמִים עֲלֶיךָ נֹגְפִים לְפָנֶיךָ בְּדֶרֶךְ אֶחָד יֵצְאוּ אֵלֶיךָ וּבִשְׂבָעָה דָּרְכִים יִנּוּסוּ לְפָנֶיךָ: ח יֵצֵא יְהוָה אֶתְךָ אֶת־הַבְּרָכָה בְּאַסְמִיךָ וּבְכָל מַשְׁלַח יָדְךָ וּבְרַכְךָ בְּאֶרֶץ אֲשֶׁר־יְהוָה אֱלֹהֶיךָ נָתַן לָךְ:

DEUTERONOMY 28:1-8 *

28:1 "NOW IT SHALL BE, IF YOU DILIGENTLY OBEY THE LORD YOUR GOD, BEING CAREFUL TO DO ALL HIS COMMANDMENTS WHICH I COMMAND YOU TODAY, THE LORD YOUR GOD WILL SET YOU HIGH ABOVE ALL THE NATIONS OF THE EARTH. 28:2 "ALL THESE BLESSINGS WILL COME UPON YOU AND OVERTAKE YOU IF

YOU OBEY THE LORD YOUR GOD: 28:3 "BLESSED SHALL YOU BE IN THE CITY, AND BLESSED SHALL YOU BE IN THE COUNTRY. 28:4 "BLESSED SHALL BE THE OFFSPRING OF YOUR BODY AND THE PRODUCE OF YOUR GROUND AND THE OFFSPRING OF YOUR BEASTS, THE INCREASE OF YOUR HERD AND THE YOUNG OF YOUR FLOCK. 28:5 "BLESSED SHALL BE YOUR BASKET AND YOUR KNEADING BOWL. 28:6 "BLESSED SHALL YOU BE WHEN YOU COME IN, AND BLESSED SHALL YOU BE WHEN YOU GO OUT. 28:7 "THE LORD SHALL CAUSE YOUR ENEMIES WHO RISE UP AGAINST YOU TO BE DEFEATED BEFORE YOU; THEY WILL COME OUT AGAINST YOU ONE WAY AND WILL FLEE BEFORE YOU SEVEN WAYS. 28:8 "THE LORD WILL COMMAND THE BLESSING UPON YOU IN YOUR BARNES AND IN ALL THAT YOU PUT YOUR HAND TO, AND HE WILL BLESS YOU IN THE LAND WHICH THE LORD YOUR GOD GIVES YOU. (NASB)

We serve a powerful God, and we do not have to worry, we can trust that God is able to do all things through faith, life, and truth!

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Dr. Duane D. Miller received his Ph.D., M.S., and B.S. Degree in Chemical Engineering from The University of Akron Ohio. He is currently a Chemical Engineering Researcher. Duane's research expertise has focused upon functional materials development for the control, conversion, and release of process gases in Energy production technologies. His R&D interests include computational chemistry, developing novel technologies for converting biomass to fuels and studying their fundamental interactions during the chemical conversion process. His past experience includes sorbent development for pre- and post-combustion CO₂ and SO₂ capture, selective absorption of H₂S from methane streams, O₂ capture for oxy-fuel combustion, photocatalytic reduction of alcohols, NO_x reduction catalysis, the development of oxygen carriers to combust fossil fuels (CH₄ and coal) for the chemical looping combustion processes, and the extraction of rare earth elements using patent pending sorbents. His research expertise has focused on operando-characterization using Infrared, Raman, and UV-Vis spectroscopy to observe the nature of the catalytic active sites and reaction intermediates under realistic reaction conditions, allowing direct correlation of molecular/electronic structures with catalyst performance during Gas-Solid / Liquid-Solid Adsorption and Photocatalytic Processes with real time online analysis of reaction products using ICP-MS and mass spectrometry. His current work involves a multi-disciplinary approach to developing, understanding, and improving the catalytic gasification of coal and methane, high temperature chemical looping combustion, and the catalytic decomposition and gasification of biomass and coal using novel microwave reactor. He has been studying the Hebrew Scriptures and the Torah for 20+ years and sharing what he has learned. The studies developed for MATSATI.COM are freely to be used by everyone, to God be the Glory!

