

2017/4

American Journal of  
Research, Education and Development

REED



ISSN 2471-9986

# American Journal of Research, Education and Development

# REED

## IMPRESSUM

American Journal of Research, Education and Development  
ISSN: 2471-9986

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## **CONTENT**

### **Ethical hacking 1.0 (terms and rules)**

*Péter Török, Imre Négyesi, János Rikk*

*National University of Public Service, Hungary*

### **Suppliance of the disabled of the Great War with artificial limbs**

*Zsolt Fejes; Sándor Mihók*

*Health Center of Hungarian Defense Forces*

### **Prevention of secondary injury of the brain after penetrating injury**

*dr. Gyula Kóródi MD PhD*

*National University of Public Service, Hungary*



## **Ethical hacking 1.0 (terms and rules)**

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### **Abstract**

Ethical hacking is a buzzword of nowadays, but what does it mean exactly? Who the ethical hackers are and what they do? The main goal of this paper is to clearly define the most important notions. What does cybercrime mean, where is the threshold between white and dark zone. What types of hackers we can identify and what skills do they need.

**Keywords:** ethical hacker, cybercrime, security threats

**„Hacking is identifying weakness in computer systems or networks to exploit its weaknesses to gain access.”**

Hacker is one of the most misunderstood and overused terms in the security industry. Everyone from the nightly news to authors to Hollywood and the rest of the media uses the term frequently. Thanks to overuse of the term and the fact that it is almost constantly attached to activities that are shady or even criminal in nature, the general public looks at anyone with the label hacker as up to no good. Hackers are viewed as those operating in the shadows, antisocial and antiestablishment in many cases. Other members of the public have even come to embrace hackers as the new social activists thwarting politicians, governments, large corporations, and others. Newsworthy events by loosely organized groups such as Anonymous and Lizard Squad have contributed to the public perception of the hacker. While many have taken different stances and have different opinions of whether hackers are good or bad, this paper will not seek to pass judgment either way on many of those who engage in hacking.

Computers have become mandatory to run a successful business. It is not enough to have isolated computers systems; they need to be networked to facilitate communication with external businesses. This exposes them to the outside world and hacking. Hacking means using computers to commit fraudulent acts such as fraud, privacy invasion, stealing corporate/personal data, etc. Cybercrimes cost many organizations millions of dollars every year. Businesses need to protect themselves against such attacks.

Among the many situations that have contributed to the increase in hacking and cybercrime are the amount of information being passed and the overall dependency on the Internet and digital devices. Over the last decade, the number of financial transactions online has increased, creating a tempting target for crooks. Also, the openness of modern devices such as smartphones and technologies such as Bluetooth has made hacking and stealing information more prevalent. Lastly, we can also point to the number of Internet-connected devices such as tablets and other gadgets that individuals carry around in increasing numbers. Each of these devices has attracted the attention of criminals with the temptation of stealing never before heard of amounts of money, data, and other resources. As computer crime laws began to be passed, the bragging rights for hacking a website became less attractive. Prank activity seems to have slowed down, whereas real criminal activity has increased. With online commerce, skills started going to the highest bidder, with crime rings, organized crime, and nations with hostile interests using the Internet as an attack vector.

**Cybercrime** is the use of computers and networks to perform illegal activities such as spreading computer viruses, online bullying, performing unauthorized electronic fund transfers, etc. Most cybercrimes are committed through the internet. Some cybercrimes can also be carried out using mobile phones via SMS and online chatting applications.

The following list presents the common types of cybercrimes:

**Computer Fraud:** Intentional deception for personal gain via the use of computer systems.

**Privacy violation:** Exposing personal information such as email addresses, phone number, account details, etc. on social media, websites, etc.

**Identity Theft:** Stealing personal information from somebody and impersonating that person.

**Sharing copyrighted files/information:** This involves distributing copyright protected files such as eBooks and computer programs etc.

**Electronic funds transfer:** This involves gaining an un-authorized access to bank computer networks and making illegal fund transfers.

**Electronic money laundering:** This involves the use of the computer to launder money.

**ATM Fraud:** This involves intercepting ATM card details such as account number and PIN numbers. These details are then used to withdraw funds from the intercepted accounts.

**Denial of Service Attacks:** This involves the use of computers in multiple locations to attack servers with a view of shutting them down.

**Spam:** Sending unauthorized emails. These emails usually contain advertisements.

### **Potential security threats**

**A computer system threat is anything that leads to loss or corruption of data or physical damage to the hardware and/or infrastructure.** Knowing how to identify computer security threats is the first step in protecting computer systems. The threats could be intentional, accidental or caused by natural disasters.

**Security Threat** is defined as a risk that which can potentially harm computer systems and organization. The cause could be physical such as someone stealing a computer that contains vital data. The cause could also be non-physical such as a virus attack. In these tutorial series, we will define a threat as a potential attack from a hacker that can allow them to gain unauthorized access to a computer system.

#### *physical threats*

**A physical threat is a potential cause of an incident that may result in loss or physical damage to the computer systems.**

**Internal:** The threats include fire, unstable power supply, humidity in the rooms housing the hardware, etc.

**External:** These threats include Lightning, floods, earthquakes, etc.

**Human:** These threats include theft, vandalism of the infrastructure and/or hardware, disruption, accidental or intentional errors.

To protect computer systems from the above mentioned physical threats, an organization must have physical security control measures.

#### *non-physical threats*

**A non-physical threat is a potential cause of an incident that may result in:**

- Loss or corruption of system data
- Disrupt business operations that rely on computer systems
- Loss of sensitive information
- Illegal monitoring of activities on computer systems
- Cyber Security Breaches
- Others






The non-physical threats are also known as **logical threats**.

Common types of non-physical threats: Virus, Trojans, Worms, Spyware, Key loggers, Adware, Denial of Service Attacks, Distributed Denial of Service Attacks, Unauthorized access to computer systems resources such as data, Phishing, Other Computer Security Risks

## Types of hackers

A Hacker is a person who finds and exploits the weakness in computer systems and/or networks to gain access. Hackers are usually skilled computer programmers with knowledge of computer security.

Hackers are classified according to the intent of their actions. The following list classifies hackers according to their intent.

Symbol	Description
	<b>Ethical Hacker (White hat):</b> A hacker who gains access to systems with a view to fix the identified weaknesses. They may also perform penetration testing and vulnerability assessments.
	<b>Cracker (Black hat):</b> A hacker who gains unauthorized access to computer systems for personal gain. The intent is usually to steal corporate data, violate privacy rights, transfer funds from bank accounts etc.
	<b>Grey hat:</b> A hacker who is in between ethical and black hat hackers. He/she breaks into computer systems without authority with a view to identify weaknesses and reveal them to the system owner.
	<b>Script kiddies:</b> A non-skilled person who gains access to computer systems using already made tools.
	<b>Hacktivist:</b> A hacker who use hacking to send social, religious, and political, etc. messages. This is usually done by hijacking websites and leaving the message on the hijacked website.

1. Table

## Skill required

As a hacker, you will need to develop skills that will help you get the job done. These skills include learning how to program, use the internet, good at solving problems, and taking advantage of existing security tools. What languages? It depends on your target computer systems and platforms.

LANGUAGES	DESCRIPTION	PLATFORM	PURPOSE
<b>HTML</b>	Language used to write web pages.	*Cross platform	<b>Web hacking</b> Login forms and other data entry methods on the web use HTML forms to get data. Been able to write and interpret HTML, makes it easy for you to identify and exploit weaknesses in the code.
<b>JavaScript</b>	Client-side scripting language	*Cross platform	<b>Web Hacking</b> JavaScript code is executed on the client browse. You can use it to read saved cookies and perform cross site scripting etc.
<b>PHP</b>	Server-side scripting language	*Cross platform	<b>Web Hacking</b> PHP is one of the most used web programming languages. It is used to process HTML forms and performs other custom tasks. You could write a custom application in PHP that modifies settings on a web server and makes the server vulnerable to attacks.
<b>SQL</b>	Language used to communicate with database	*Cross platform	<b>Web Hacking</b> Using SQL injection, to by-pass web application login algorithms that are weak, delete data from the database, etc.
<b>Python</b> <b>Ruby</b> <b>Bash</b> <b>Perl</b>	High level programming languages	*Cross platform	<b>Building tools &amp; scripts</b> They come in handy when you need to develop automation tools and scripts. The knowledge gained can also be used in understand and customization the already available tools.
<b>C &amp; C++</b>	High level programming	*Cross platform	<b>Writing exploits, shell codes, etc.</b> They come in handy when you need to write your own shell codes, exploits, root kits or understanding and expanding on existing ones.

2. Table

\* Cross platform means programs developed using the particular language can be deployed on different operating systems such as Windows, Linux based, MAC etc.

## The process

- **Gather Information:** This is the first stage, the learns as much as he can about the intended victim. The information is gathered from company websites, other publications and sometimes by talking to the users of the target system.
- **Plan Attack:** The attackers outline how he/she intends to execute the attack
- **Acquire Tools:** These include computer programs that an attacker will use when launching the attack.
- **Attack:** Exploit the weaknesses in the target system.



- **Use acquired knowledge:** Information gathered during the social engineering tactics such as pet names, birthdates of the organization founders, etc. is used in attacks such as password guessing.

Information plays a vital role in the running of business, organizations, military operations, etc. **Information in the wrong hands can lead to loss of business or catastrophic results. To secure communication, a business can use cryptology to cipher information.**

**Social engineering** is the art of manipulating users of a computing system into revealing confidential information that can be used to gain unauthorized access to a computer system. The term can also include activities such as exploiting human kindness, greed, and curiosity to gain access to restricted access buildings or getting the users to installing backdoor software.

**Cryptography** is the study and application of techniques that hide the real meaning of information by transforming it into nonhuman readable formats and vice versa.

**Cryptanalysis** is the art of trying to decrypt the encrypted messages without the use of the key that was used to encrypt the messages. Cryptanalysis uses mathematical analysis & algorithms to decipher the ciphers.

The success of cryptanalysis attacks depends

- Amount of time available
- Computing power available
- Storage capacity available

commonly used Cryptanalysis attacks:

- **Brute force attack**– this type of attack uses algorithms that try to guess all the possible logical combinations of the plaintext which are then ciphered and compared against the original cipher.
- **Dictionary attack**– this type of attack uses a wordlist in order to find a match of either the plaintext or key. It is mostly used when trying to crack encrypted passwords.
- **Rainbow table attack**– this type of attack compares the cipher text against pre-computed hashes to find matches.

### **So, What Is an Ethical Hacker?**

Ethical Hacking is identifying weakness in computer systems and/or computer networks and coming with countermeasures that protect the weaknesses. Ethical hackers must abide by the following rules.

- Get written permission from the owner of the computer system and/or computer network before hacking.
- Protect the privacy of the organization been hacked.
- Transparently report all the identified weaknesses in the computer system to the organization.
- Inform hardware and software vendors of the identified weaknesses.

## WHY?

Information is one of the most valuable assets of an organization. Keeping information secure can protect an organization's image and save an organization a lot of money. Hacking can lead to loss of business for organizations that deal in finance such as PayPal. Ethical hacking puts them a step ahead of the cyber criminals who would otherwise lead to loss of business.

### **What Are Your Responsibilities?**

One of the details you need to understand early and never forget is permission. As an ethical hacker you should never target a system or network that you do not own or have permission to test. If you do so, you are guilty of any number of crimes, which would be detrimental not only to your career but perhaps to your freedom as well. Before you test a target, you should have a contract in hand from the owner giving you permission to do so.

Also remember that you should test only those things you have been contracted to test. If the customer or client decides to add or remove items from the test, the contract must be altered to keep both parties out of legal trouble. Take special notice of the fact that ethical hackers operate with contracts in place between themselves and the target. Operating without permission is unethical; operating without a contract is downright stupid and illegal.

In addition, a contract must include verbiage that deals with the issue of confidentiality and privacy. It is possible that during a test you will encounter confidential information or develop an intimate knowledge of your client's network. As part of your contract you will need to address whom you will be allowed to discuss your findings with and whom you will not. Generally, clients will want you to discuss your findings only with them and no one else.

According to the International Council of Electronic Commerce Consultants (EC-Council) you, as a CEH, must keep private any confidential information gained in your professional work (in particular as it pertains to client lists and client personal information). You cannot collect, give, sell, or transfer any personal information (such as name, email address, Social Security number, or other unique identifier) to a third party without your client's prior consent. Keep this in mind since a violation of this code could not only cause you to lose trust from a client but also land you in legal trouble. Contracts are an important detail to get right; if you get them wrong it could easily mean legal problems later. The problem with contracts is that most people find the legalese nearly impossible to understand and the amount of preparation intimidating to say the least. I strongly recommend that you consider getting a lawyer experienced in the field to help you with contracts.

A contract is essential for another extremely important reason as well: proof. Without a contract you have no real proof that you have permission from the system owner to perform any tests.

Once ethical hackers have the necessary permissions and contracts in place, they can engage in penetration testing, also known as pen testing. This is the structured and methodical means of investigating, uncovering, attacking, and reporting on the strengths and vulnerabilities of a target system. Under the right circumstances, pen testing can provide a wealth of information that the owner of a system can use to plan and adjust defenses.



## Ethical Hacking and Penetration Testing

Ethical hackers engage in sanctioned hacking—that is, hacking with permission from the system’s owner. In the world of ethical hacking, most tend to use the term pentester, which is short for penetration tester. Pentesters do simply that: penetrate systems like a hacker but for benign purposes.

As an ethical hacker, you must become familiar with the lingo of the trade. Here are some of the terms you will encounter in pen testing:

**Hack Value** This term describes a target that may attract an above-average level of attention from an attacker. Presumably because this target is attractive, it has more value to an attacker because of what it may contain.

**Target of Evaluation** A target of evaluation (TOE) is a system or resource that is being evaluated for vulnerabilities. A TOE would be specified in a contract with the client.

**Attack** This is the act of targeting and actively engaging a TOE.

**Exploit** This is a clearly defined way to breach the security of a system.

**Zero Day** This describes a threat or vulnerability that is unknown to developers and has not been addressed. It is considered a serious problem in many cases.

**Security** This is a state of well-being in an environment where only actions that are defined are allowed.

**Threat** This is considered to be a potential violation of security.

**Vulnerability** This is a weakness in a system that can be attacked and used as an entry point into an environment.

**Daisy Chaining** This is the act of performing several hacking attacks in sequence with each building on or acting on the results of the previous action.

As an ethical hacker, you will be expected to take on the role and use the mind-set and skills of an attacker to simulate a malicious attack. The idea is that ethical hackers understand both sides, the good and the bad, and use this knowledge to help their clients. By understanding both sides of the equation, you will be better prepared to defend yourself successfully. Here are some things to remember about being an ethical hacker:

You must have explicit permission in writing from the company being tested prior to starting any activity. Legally, the person or persons who must approve this activity or changes to the plan must be the owner of the company or their authorized representative. If the scope changes, you must update the contract to reflect those changes before performing the new tasks.

You will use the same tactics and strategies as malicious attackers. You have the potential to cause the same harm that a malicious attack will cause and should always consider the effects of every action you carry out.

You must have knowledge of the target and the weaknesses it possesses.

You must have clearly defined rules of engagement prior to beginning your assigned job.

You must never reveal any information pertaining to a client to anyone but the client.



If the client asks you to stop a test, do so immediately.

You must provide a report of your results and, if asked, a brief on any deficiencies found during a test.

You may be asked to work with the client to fix any problems that you find. As I will discuss several times in this text, never accept a verbal agreement to expand test parameters. A verbal agreement has no record, and there is a chance of getting sued if something goes wrong and there's no record.

Under the right circumstances and with proper planning and goals in mind, you can provide a wealth of valuable information to your target organization. Working with your client, you should analyze your results thoroughly and determine which areas need attention and which need none at all. Your client will determine the perfect balance of security versus convenience. If the problems you uncover necessitate action, the next challenge is to ensure that existing usability is not adversely affected if security controls are modified or if new ones are put in place. Security and convenience often conflict: The more secure a system becomes, the less convenient it tends to be.

Although ethical hacking sometimes occurs without a formal set of rules of engagement, pen testing does require rules to be agreed on in advance in every case. If you choose to perform a pen test without having certain parameters determined ahead of time, it may be the end of your career if something profoundly bad occurs. For example, not having the rules established before engaging in a test could result in criminal or civil charges, depending on the injured party and the attack involved. It is also entirely possible that without clearly defined rules, an attack may result in shutting down systems or services and stopping the functioning of a company completely, which again could result in huge legal and other issues for you.

We hope to successfully clarify some basic concepts. Knowing them, we can play with clear rules, protecting ourselves from serious problems.

Real learning can begin...



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## **Suppliance of the disabled of the Great War with artificial limbs**

*Zsolt Fejes; Sándor Mihók*

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### **Abstract:**

In most of the cultures, warriors who seriously got injured in battle. Various charitable and humanitarian organizations played a significant role in the care and rehabilitation of soldiers injured in the First World War. State involvement with disabled people was more outlined in the years after entering the war. It is very important to see, that in Hungary those who were injured in battle got much more care and more treatment, like in England, Germany or Austria, than those who have been born or injured disadvantaged in non-combat events.

**Keywords:** artificial limbs; rehabilitation, military care

## INTRODUCTION

In most of the cultures, warriors who seriously got injured in battle, like in ancient Sparta, enjoyed public esteem, so taking care of them is a special expression of social tolerance. Various charitable and humanitarian organizations played a significant role in the care and rehabilitation of soldiers injured in the First World War. State involvement with disabled people was more outlined in the years after entering the war. It is very important to see, that in Hungary those who were injured in battle got much more care and more treatment, like in England, Germany or Austria, than those who have been born or injured disadvantaged in non-combat events. An example of caretaking of different quality: English soldiers who lost their foot in war were entitled to get a better and artistically constructed prosthesis than civilians. In Germany, Austria and Hungary, the issue of injured soldiers was always considered to be the responsibility of the Ministry of War. The homecoming was not demobilized and mostly nursed separately, but civil organizations also have been involved in their post-treatment and rehabilitation. In the case of the central powers, under the influence of the German social policy model, the state committed themselves to assist and reeducating injured soldiers, and often providing interest-free loans for those who intended to open industry or start trading. [1]

### **About the disabled ones and the Hungarian military care**

Before we draw up the system of organizations dealing with the disabled, it is necessary to clarify that during the First World War who was considered to be disabled in Hungary. "Crippled a person who became injured or permanently injured in bodily injuries suffered during the course of personal military service has become completely unfit for military service and has lost all or part of his civil capacity at least to the extent that he or she is in need of public aid." The word for crippled is nowadays replaced by injured, permanently ill, disabled and other Hungarian expressions. which are much subtler, more varied, and perhaps not so offensive for the long-lasting or temporary condition that characterizes people who are injured in accident. These terms were not used in during the Great War, but instead it was referred to them using a word characterized by their physical problem such as handicapped, mutilated, invalidus, crippled, flawed, foolish, mentally ill, distorted, hunchbacked, deaf, blind, bright, dwarf and so on.

It is worth mentioning that during the First World War - and in later decades – the following ones were supported because of military service: disabled people, war widows and other members of the family supported by soldiers who had died heroically. The concept of military care meant a regular support for all of those who have suffered major damage as a result of the war. [2]

In the spring of 1915, the Hungarian government established an organization, called Caretaker Board for Amputee and Handicapped Soldiers, which aimed at providing professional after-care for non-healed injuries and the supply of mutilated soldiers with artificial limbs.

István Tisza, the chair and Kuno Klebelsberg the vice-chairman of the board, made a census about the handicapped. According to the report, until 31 March 1915, they received data from a total of 20162 mutilated and crippled Hungarian citizens of which 6015 were "mutilated", 12509 were crippled and the rest something else (eg. blind, deaf). However, these data did not correspond to

reality, the number of potential care receivers could be much higher. [3] People were shocked by the sight of trumped soldiers suddenly appearing everywhere. Because of social pressure, the Act XV. of 1915 was born with its implementing regulations, about the provision of disabled soldiers. The regulation 3000 of 1915 was about the post-treatment of injured soldiers, the supply of artificial parts and the practical training of injured soldiers. Regulation Act 3301 of 1915 decided on the institutional background of the aftercare, about the task of the Disability Affairs Office. The law and its implementing regulations provided the legal framework for the first comprehensive rehabilitation system in Hungary. [4]

Regulation Act 900 of 8 March 1917 by the prime minister declared taking care of disabled soldiers and their family members, war widows and orphans to be a national duty, and stated that the State is obliged to fulfil it with the involvement of local government authorities and society. For the coordination of the process the Military Care Office (set up in 1917) was appointed, which took over the organization and powers of the Disability Affairs Office. [5]

In addition to the Military Care Office, in 1918 local offices were established, where disabled soldiers, widows and orphans could receive advice, financial support and help with their war-related affairs. After the First World War, at the end of 1919, the Ministry of Public Health (subsequently the Ministry of Public Welfare and Labour) was responsible for dealing with the military affairs. [6]

### **Disability benefits – Institutional order for supply artificial limbs**

The first task in relation to wounded during the war was that anyone who could be saved from disability, should be saved. The XV./1915. section 8 states that all people belonging to the armed forces who have changed their working ability due to an injury or illness during the war are entitled to receive medical treatment and other retraining for civilian occupation. In Hungary, the treatment and education could have happened only in facilities set up by the National Military Care Office. Disabled people were recruited through the relevant military headquarters, which mediated between the disabled and the Office. The right for post-treatment and education persisted even if an administrative error occurred. The institutes of the Office were civilian state facilities, where the costs were covered by the joint army for a year, and then the Office took over the financing of medical treatment or teaching. Among the many benefits, the limb prosthesis was significant due to the large number of mutilated soldiers. The Military Care Office assessed the family relations of referrals, previous occupation and financial situation. The directive was to stick everyone to their original occupation and preferably in their original environment. [7]

### **The medical aftercare and suppliance of disabled soldiers with artificial limbs**

Two main categories of the post-treatment of disabilities were distinguished: surgical and orthopaedic treatment. The first one worked with various types of wounds and surgical procedures ranging from removing projectiles, through various bone surgery and amputations to the most specific neural surgery (releasing paralyzing nerve growth, removing neural tumours caused by shot, seaming damaged or broken nerves, etc.). A special section of surgical healing was cranial surgery, including the facial surgery which, for example, was carried out because of the partial or complete absence of



the nose. Oral doctors have achieved remarkable results in the field of oral surgery, for example jaw break was successfully treated with the help of various tensile, support and fixing inserts or devices. [8]

Providing soldiers with artificial limbs was also an important part of the military care. Based on Klebelsberg's vision (who was the State Secretary to the Minister of Religion and Education) and his plan: „Each mutilated soldier receives two artificial limbs on state expense, from the Office, a work prosthesis and a cosmetic one”. It is worth to note that expiration time of the artificial limbs was two years. Private artificial limb factories operating before the war were not able to properly meet demand after 1915, so the state set up new artificial limb workshops. The Disability Affairs Office in Budapest organized a workshop in the higher industrial school of the state for manufacturing artificial body parts. The workshop was managed by Gyula Dollinger, a world-renowned chief surgeon who has been recognized as the creator of Hungarian orthopedics. The paths of the higher industrial school and the artificial limb workshop were separated after 1917, and the self-employed artificial limb factory and the related vocational school were established. The production of hand and arm prostheses requiring finer technical design was organized in the workshops of the State Mechanical and Watchmaking Vocational School, where the appropriate instruments were available. Small prostheses producing workshops was set up in several other vocational schools, such as at the higher industrial school in Kassa, at the industrial vocational school in Bratislava, Győr, Debrecen, Cluj-Napoca, Arad and Timișoara. Among the rural workshops the largest was in Bratislava. The importance of which shows that between July 18 and August 26, 1917 the National Military Care Exhibition was organized in halls and workshops of the metal vocational school. A correspondent from Bratislava painted the following picture about the disabled ones working in the workshops of the exhibition:

*There are also standing there the disabled heroes in one of the room of the exhibition. The Great Johns, the Little Peters, the anonymous heroes who allegorize war itself and all the suffering. One of them has two artificial legs, if he was not showing it, nobody would notice it. For a farmer was made an artificial hand with which he could get a spade and a hoe, the blacksmith could grip a hammer with his hook-hand and so on... Everyone gets an artificial limb that he can continue his work with (...)The truncated soldier will no longer be a wondering pariah, he was led back to work, to the triumphant life .. [9]*



**Picture 1. The poster of Exhibition of the National Military Care Office (1917)**

(Source: <http://www.pozsonyikifli.sk/hu/Friss-kifli/Nagy-Haboru/Ketezer-csonka-testu-hos-Pozsonyban.html>)

## **PRESENTATION OF MEDICAL OR TECHNICAL HISTORY OF THE ARTIFICIAL LIMBS**

During a mutilation surgery in war conditions, the main goal was to keep the injured alive. There was neither time nor opportunity for the precise design of the chunks. These war chunks were usually unsuitable for enduring everyday load. In those prostheses, in which the load-bearing surface was such a chunk, bruising, infection, and constant pain was frequent. After a while the prosthesis became unusable and the invalids became immovable. Dollinger did not only relocate the load-bearing surfaces, but solved the link between the body and the artificial limb, not in the old ways, but with the steel straps formed in that area. Thus, the load spread over a larger surface. The new artificial limbs were more useful, more practical, easier to handle, and last but not least safe than the old ones. [10]

In the following, we look at the professional "protocol" of the workshop run by Gyula Dollinger and through this we present the practical operation of the artificial limb supply system. In 1915, all Hungarian mutilated in war were collected in the Laudon barracks in Budapest. From here, the Red Cross took them to the Révész Street Disabled Hospital in groups of ten, where Professor Dollinger made plaster samples of their stumps. These samples were poured out in the artificial limb workshop, and drew the blueprint of the prepared prosthesis onto the prepared sample. As Dollinger pointed out, it is not possible to make a good artificial limb by using the same sample for everyone. Those who did harder physical work in their civic life received two artificial limbs: a temporary one for work and a final one. The temporary limb consisted of four steel cradles, which ended at a steel bottom. The final artificial limb replaced the original body part cosmetically as well. It was made of nickel-

plated steel cradles and leather, wearing shoes on the feet. Until October 1915, the workshop produced 758 limbs for work and 193 final limbs, plus 340 other body balancing equipments, 415 pairs of shoes, 630 tights. By the end of the year, they could deliver approximately 100 artificial limbs per week. Particular attention was also paid to the use of training, as the use of artificial limbs requires the use of appropriate techniques, which was carried out at the Révész Street Hospital and the barracks hospital at Pozsonyi Street. From 1916, the caring procedure was preceded in the following way: The truncated people were transported to the Timót Street hospital (600 beds), where they started to work on the artificial limb only if the patient was cured and the chunk was already perfectly appropriate for making a plaster. The artificial limbs were transferred once a week with medical checkups. From 1917, the artificial body parts making workshops in Budapest was managed by the Ministry of Trade Affairs. The Military Care Office contributed 500,000 Hungarian korona to the workshops to become artificial limb factory, and the other expenses were borne by the Ministry of Trade Affairs. The factory was still controlled by the National Military Care Office. The industry schools were also used for the repair of artificial limbs. By September 30, 1917 the workshops produced a total of 19034 prosthesis. [11] It is worth mentioning that, in addition to the above, significant medical development work was also performed in the institutions above. For example, the Bratislava Institute of the Military Care Office, led by Professor Lajos Bakay, considered a renowned European expert, has achieved remarkable results in improving the artificial limbs of femur amputated people. The "self-powered knee brake" they developed was a very simple but solid and reliable medical device, as it did not contain small and delicate components. Its practical advantage is that it could be inserted into the work prosthesis, the cosmetic limb and into the final artificial limbs. [12]



Picture 2. Disabled during military service (Source: <http://www.pozsonyikifli.sk/hu/Friss-kifli/Nagy-Haboru/Ketezer-sonka-testu-hos-Pozsonyban.html>)



## Summary

During the First World War, to help of disabled and mutilated young soldiers (protetization, training, social care, re-employment), a complex rehabilitation system emerged for the first time in Hungarian military healthcare, which is still exemplary. [13] This is supported by some figures, which illustrates the magnitude of the era's military caregiver activities: At the end of 1918, 90 000 disabled people were registered at the National Military Care Office, of which 70 000 people were granted some kind of institutional treatment and education. The artificial limb manufacturing workshops provided 24 262 disabled people with prostheses and medical aids. (There were four post-treatment institutes in Budapest with 5396 beds, the three institutions with 4130 places for rehabilitation of people with disabilities in the countryside. Eight schools were set up for the disabled, with 1323 seats, with different educational profiles. The number of special hospitals was nine, with 8270 beds.)

As the result of the rebellions following the World War and the Treaty in Trianon, the whole military care organization broke down. Its assets were partially squandered during revolutions, his movable property partially depreciated, the institutions disappeared, most of them were used for other purposes. Basically, only the annuity service survived, which was shamefully little for the tended ones and for the nation as well. Legislative regulation of military care is only governed by Act VII. of 1933. At that time, 220,000 wounded were registered and given some kind of care. The Hungarian military care was reorganized only in 1943, due to the new apocalypse .[14]

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## **Prevention of secondary injury of the brain after penetrating injury**

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### **Abstract**

There are very limited therapeutic options for medical services during the shooting skull injuries treatment. Only few hours after the severe head trauma are available for detecting the damaged locating, rescue, stabilization and transport of hospital condition. During this time, the brain tissue at the molecular level processes are started which are progressing according to complex laws of causing further damage and demolish the damaged prospects and the chances of healing. My aim was to emphasize that I compiled solution above the normal level of total antioxidant capacity, thereby achieving a reduction in post-traumatic cerebral edema. I performed to verify the above, the following tests on animals weighing from 300 g Vistar female rats. My first goal is to measure the total antioxidant capacity of the animals, using a simple and cheap method. This value indicates the total capacity of the organization, which is suitable for the resultant free radical conclusion, that an exact assessment of the pre-treatment. The second goal was to verify the methodology described above, compiled by the dietary supplement able to increase total antioxidant capacity of healthy animals. Based on the results of animal experiments I carried out, it stated that the organization's total antioxidant capacity of blood and urine samples can be determined using the method I have described.

**Keywords:** brain injury, edema, neurological damage

## Introduction

There are very limited therapeutic options for medical services during the shooting skull injuries treatment. Only few hours after the severe head trauma are available for detecting the damaged locating, rescue, stabilization and transport of hospital condition. During this time, the brain tissue at the molecular level processes are started which are progressing according to complex laws of causing further damage and demolish the damaged prospects and the chances of healing.

Above is a summary of secondary brain injury called a distinction between the primary trauma caused damage [1].

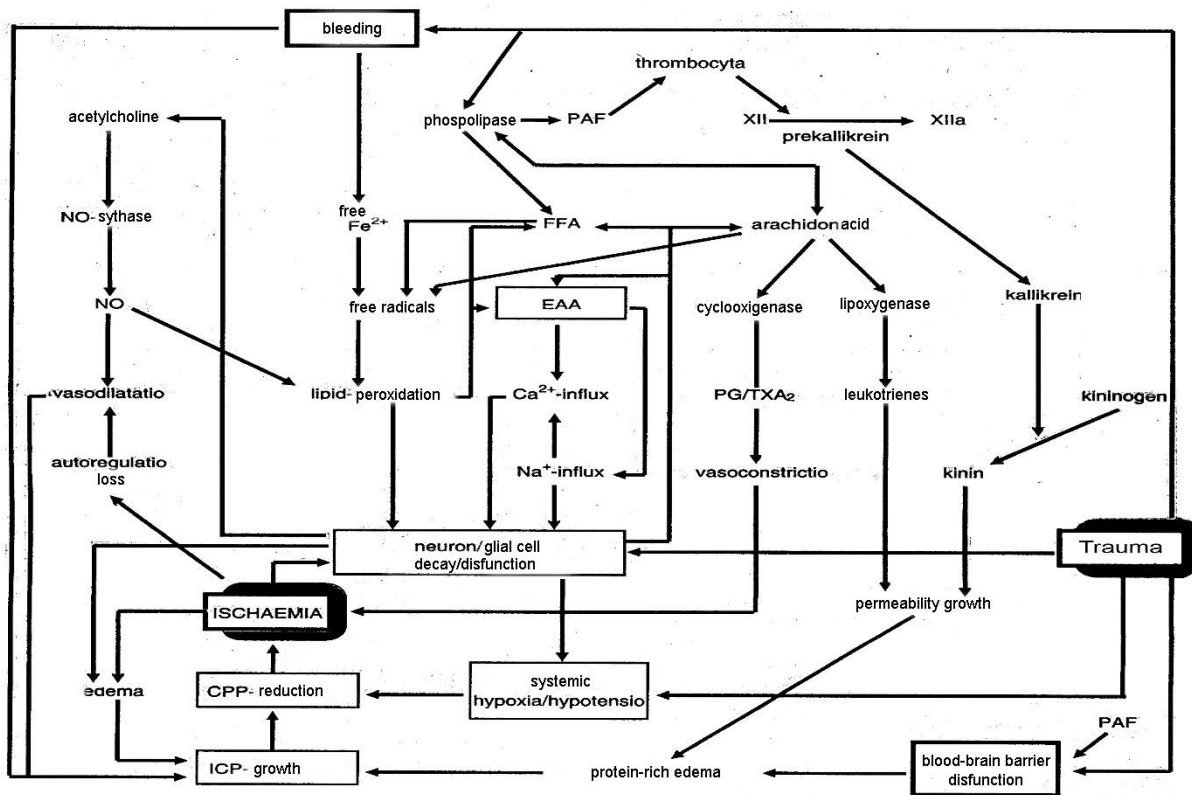


Figure 1: The secondary nerve tissue damage, Ed.: Kóródi Gyula

The primary lesions and after the moment of the trauma are formed directly over the brain as a result of mechanical insult. Surgical intervention can be removed as the projectile, the bone fragments and all the foreign matter, the damaged nervous tissue, hematomas and restored the continuity of dura but ongoing disease processes at the molecular level is not influenced at this level. The medication in the ongoing attempts to reduce secondary brain damage, so just expect new results are from the methods that is able to turn up somewhat in advance against damage in the physiological process.

## Analysis of the problem

### The primary neurological damage

The primary damage to the moment of the trauma, and then immediately occurs, the nerve tissue has a mechanical insult consequence; hemorrhages, contusions and diffuse axonal injury, excluded [1]. Examining the effect of penetrating gunshot injuries Damage prominent tissue damage caused by the kinetic energy of the projectile passed tissue. This kinetic energy is proportional to the square of projectile weight and proportional to its speed [2]. Ballistics this foundation, it follows from the harmful impacts in terms of the speed of the projectile parameters that define. 800-900 m / sec speeds - the majority of injuries can range shooting war - is gradually beginning to dominate the "hydrodynamic" effect, with devastating effect fabric over 1500 m / sec speeds even higher [2]. The incoming projectile at high speed and cause high water content closed cranial shock wave, which not only damages the path of tissues, but multi beyond the direct trauma effect. The shock waves occur instantaneously transmitted to the nervous tissue traced down from the same stem from the transition cavities as well [3].

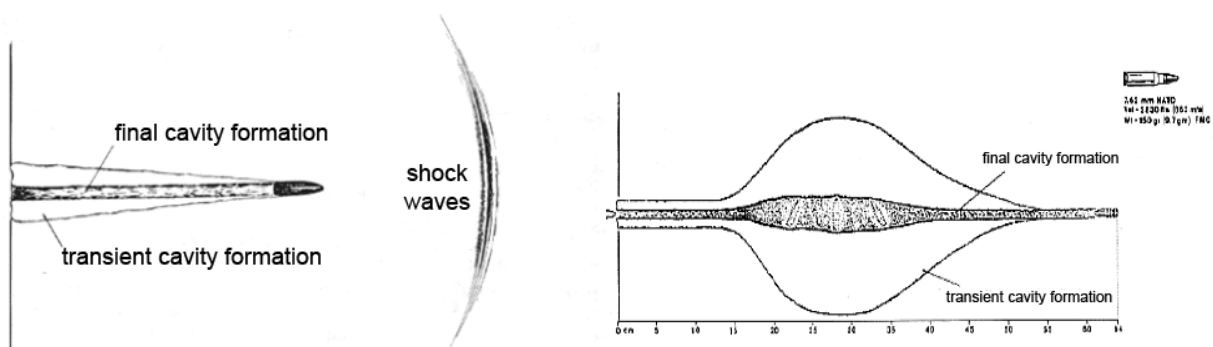


Figure 2a, 2b: The bullet tissue cavity-forming effect Ed.: Kóródi Gyula, Source: Williams A.: Characterization of the Rat Penetrating Brain Injury in: Histopathology and Behavior, Advanced Technology Applications for Combat Casualty Care 2004 Conference August 18, 2004 in St. Pete Beach, Florida

The primary cause of cavities is tissue-damaging effect [4], but it plays a significant role in the development of infectious complications following a gunshot injury, as the cavity instantaneously discontinued dirt from the outside of the heart shooting channel. Ballistics further details of the analysis of disregard, for treatment to reduce secondary brain injury is not affected. The tissue destructive effects are highlighted above, it follows that suffered the direct destruction of nerve cells



to regenerate no hope, while the far - Definitive did not cause an exposure of up - to rescue areas ("penumbra") may open opportunities. In a decisive role previously discussed in detail in cerebral blood flow and oxygen permanent control and optimization.

### The secondary neurological damage

The high rate of mortality suffered gunshot injuries to the skull examining the causes accurate knowledge is essential to clarify the physical and chemical processes that take place between the shot and the moment of death. In the third chapter, I analyzed the intracranial pressure and cerebral blood flow regularities of the physical, so here I study the neurological damage secondary to mitigate used chemical mechanisms, including processes I search for edema of the brain tissue after trauma decreasing.

Ongoing dynamic balance of the body, oxidation and reductive processes are one of the biochemical basis of physiological functions. In the intermediate metabolism of free radicals are generated continuously - acting to "oxidative stress" [5] status - which is a kind of antioxidant mechanisms of the body's defense is concluded [6].

#### Free radicals

- hydrogen peroxide
- superoxide radical
- hidroxy radical
- peroxy radical
- Nitric oxide
- singlet oxygen
- Hem proteins
- peroxy nitrit
- hypochloric acid

#### Scavenger antioxidants

Enzymes-Small molecules

- superoxide
- dismutase
- glutation
- peroxidase
- glutation reductase
- catalase
- metallo proteines
- enzymes
- glutation
- vitamin C
- vitamin E
- bilirubin
- carotionids
- flavonoids

Table 1: Source: Noseworthy-Bray: *Effect of oxidative stress on brain damage detected by MRI and in vivo 31P-NMR, Free Radic. Biol. Med. 1998 Apr.; 24(6):942-51.*

All chemical potential of free radicals conclusion that can be mobilized as a "total antioxidant capacity" measurable parameters [7]. As the nerve tissue after a gunshot injury to a major free radical formation starts, instant tissue-damaging effect can only be compensated if the antioxidant capacity has been able to increase prior to the injury. My working elevated antioxidant capacity as previously used occur as a result of trauma caused by the release of free radicals to reduce brain edema. If the intense antioxidant capacity capable warrior has vasogenic brain edema resulting from gunshot

injuries mitigate - so damaged compensation has a reservoir in the early stage when the therapeutic prehospital accessibility minimal. The vasogenic brain edema following the trauma has already occurred and the fourth peak hours [8], one of the reasons - the blood-brain barrier opening up, in the vein exiting fluid between cells during the first hour after the injury [9].

### **Methods, Scientific objectives**

My aim was to emphasize that I compiled solution above the normal level of total antioxidant capacity, thereby achieving a reduction in post-traumatic cerebral edema. I performed to verify the above, the following tests on animals weighing from 300 g Vistar female rats.

### **New method to measure the total antioxidant capacity**

My first goal is to measure the total antioxidant capacity of the animals, using a simple and cheap method. This value indicates the total capacity of the organization, which is suitable for the resultant free radical conclusion, that an exact assessment of the pre-treatment. The animals were placed in metabolic cages and urine is collected daily both supplied the sample. The urine and serum total antioxidant capacity as well correlated [10], and therefore simpler and bloodless sampling chosen. I defined this method of free fluid intake and food intake of 20 healthy, Vistar female rats weighing 300 g, total antioxidant capacity addition.

### **The supra-normal total antioxidant capacity levels**

The second goal was to verify the methodology described above, compiled by the dietary supplement able to increase total antioxidant capacity of healthy animals.

The liquid introduced was a red grape juice concentrate, the components of which were shown in Figure 3. As a nutritional supplement, the mix of 40 mg of "Resveratrol" and 35mg of "Granavita" per bodyweight in kilogram per day were gauged. The active ingredients of Granavita are barbipolisaccharide, ellagic acid and zeaxanthin, and the Resveratrol is 98% t-resveratrol (polygonum cuspidatum) was.

### Red grape Juice Concentrate 65 Brix (clear)

Analytical values of Concentrate	Unit	Average	Range
Soluble solids refract.	°Brix (20 °C)	65,0	62,5-66,5
Total acids as citric acid	g/kg (pH 8,1)	11,6	4,7-23,3
Total acids as tartaric acid	g/kg (pH 7,0)	12,5	5,0-25,0
pH-value			2,8-4,1
relative density (20°/20°C)		1,319	1,303-1,328

Analytical values after reconstitution to single strength juice	Unit	Average	Range
Soluble solids refract	°Brix (20°C)	17,0	16,0-18,0
Total acids as tartaric acid	g/l (pH 7,0)	3,5	1,7-4,0
Total acids as citric acid	g/l (pH 8,1)	3,2	1,3-6,5
Colour Unit at 435 nm *			0,035-0,150
relative density (20°/20°C)			1,065-1,074

\*(1g conc. + 99g H<sub>2</sub>O bidest.)

Microbiological values	(Values refer to unopened aseptic packages)
Total plate count	< 100/g
Yeast	<10/g
Mould	<10/g
E-coli and other coliforms	neg./g

Shelf life (from date of production)		
aseptically packed goods (BIB** and BID***, not opened)	recommended at 0°C to +4°C	24 months

\*\*BIB= Bag In Box, \*\*\*BID= Bag In Drum

Figure 3: product specification, based on Manufacturer's information

Participating in the first experiment, murine, or 10 days for 5 animals dosed solely to the above solution in place of drinking water, free liquid intake and food intake was unchanged secured. The remaining 10 animals were used as controls unaltered food and water consumption. The animals were kept in cages metabolic continuously collected after the start for all individuals and urine twice daily (every 12 hours) were determined in total antioxidant capacity.

## Results

The measurement data of 10 control animals did not differ from the previous ones, but the rats treated with 10 values of the initial 100% to 117% in increased, so managed to achieve a significant increase. The assembled solution capable of increasing the antioxidant levels in normal and where the ability to lower blood-brain barrier disruption, may be suitable for vasogenic edema "prophylactic treatment".

### Reducing secondary brain injury antioxidant effect of „pre-treatment”

10-10-treated and control animals used in previous measurements, the fifth day of the trial - ie when treated with higher antioxidant capacity was proven - freeze lesion cerebral edema dropping experiment was carried out [11]. My question was that if the constant cortical insult to the large amount of animals treated with radical binding capacity of blood-brain barrier disruption will be minor compared to the control. The animals' halothane and oxygen / nitrogen oxide using 30/70% narcosis anesthetized skulls were recorded over the frontal lobe and dropped straight skin incision, high-speed drill with a diameter of 0.5 cm bone window opened skulls. After opening the dura mater acetone using carbon dioxide snow-chilling -50 degrees Celsius cooled to 3 mm in diameter, flat-soled copper cylinder 5 seconds of exposure time violations dropped by freezing the cortical surface. After closing of the skin wound on the right femoral vein in 1 ml of 2% Evans blue was injected & albumin. This is an insult to the paint as the site of the blood-brain goes outside the vein, and the edema is proportional to the degree of discoloration due to damage caused by the dam. After an hour after the intravenous injection the animals were sacrificed and their brains were performed emphasizing digital interface shooting. The photos can be seen painted area biometric T-test processed got the following results:

Number	Untreated	Treated
1	30,70	16,70
2	24,04	21,40
3	21,93	10,50
4	41,60	14,20
5	26,30	12,50
6	19,40	14,10
7	32,70	19,50
8	34,10	11,70
9	43,60	10,20
10	23,10	21,80
<b>Average:</b>	29,75	15,26
<b>SD:</b>	08,29	04,37

**T probe: 0,000117392**

Table 2.: The extent of cerebral edema in rats mm<sup>2</sup>

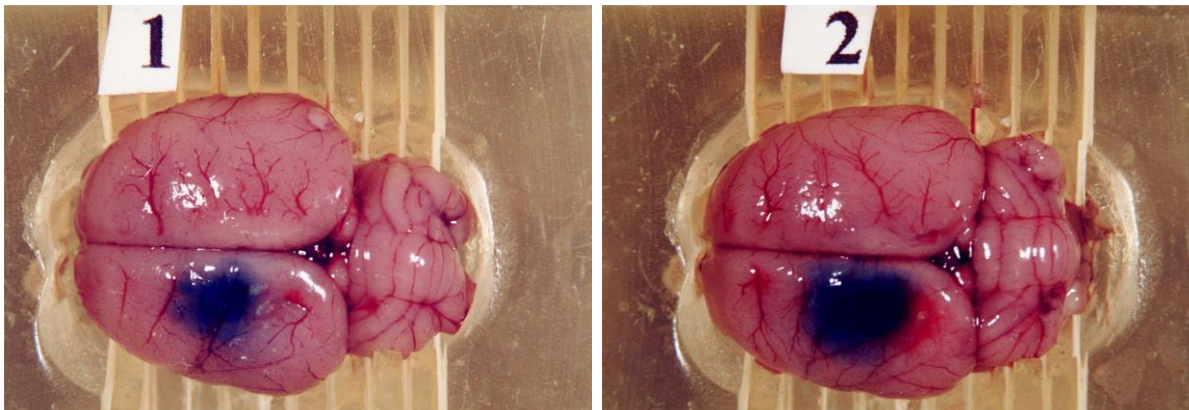


Figure 4.: Brain edema of the antioxidant preconditioned (1) and the untreated (2) rats

## Discussion

### New method to determine the total antioxidant capacity of the body in urine and blood

Based on the results of animal experiments I carried out, it stated that the organization's total antioxidant capacity of blood and urine samples can be determined using the method I have described. The latter option sampling easier, faster, and is not associated with blood inconveniences. Only three microliters of urine samples sufficient to 620 nm to determine the total antioxidant capacity. Another advantage of the developed method that is very cost-effective, high series of human use is therefore no financial considerations, nor to limit the inconveniences associated with the blood test does not.

### Description of increasing the total antioxidant capacity suitable method - preconditioning treatment

Experimental results it can state that the total antioxidant capacity of healthy animals kept on a normal diet did not increase the parameters useless, but proper supplements can be increased. This "trapping" in a few days measurements proven feasible. The individual components were compiled using your existing itself can add up to free radical binding capacity was capable of total antioxidant capacity of the healthy, animals mixed diet have increased supra-normal level.

### The blood-brain barrier damage and reduce the vasogenic edema applicable pretreatment

It managed to raise the solution was compiled using the antioxidant capacity and thus preconditioned animals treated rat cerebral edema caused standardized "cold insult" method was significantly lower compared to the untreated control. The post-traumatic cerebral edema, increased intracranial pressure decreases can be held liable is a key factor. The interventions in order to provide oxygen and blood supply to the brain - airway, respiration, bleeding, fluid resuscitation, cerebral blood flow pressure (CPP) maintain - a biochemical approach, supplemented. interventions in order



to reduce the intracranial pressure (ICP), the efficiency can be improved if we act against pre-treatment of cerebral edema.

### **Workability, suggestions**

Of course, results are not adaptable animal suffered a brain injury fighter shot and scope of the problem can not be drawn from them have far-reaching consequences not human. Based on promising animal results in the method and the assembled solution seeks to involve proprietary. To begin human trials by the National Laboratory Institute (OLI) plan filed with the methodology, in order to validate its official.

The medication targets a traditionally been developed to reverse the disease process. In contrast, the preconditioning treatment I have described can be achieved by a variety of molecular-level protection from the secondary neurodegenerative damage. As a human therapeutic legacy at this stage of the research, approximately neither be predicted, but other possibilities inherent in the method of work trying to exploit.

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ISSN 7234561-6