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New immune therapies combined with complementary-oncology measures

... together, we are stronger!

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Passionate physician and scientist for 31 years with specialty training in Germany and the USA.

As a renowned pediatrician, his research focus is on immunotherapy approaches for the treatment of malignant diseases in infancy. He is also known as one of the leading experts in the field of stem cell transplantation for children suffer-ing from leukemia. Further expertises are diabetes mellitus in children and adoles-cents, allergies, cystic fibrosis, and organ transplantation in children.

'The constant exchange of experiences with colleagues, continued training at the highest level, and timely implemen-tation of research results have special significance in our profession.'

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'Nature is the best physician – it can heal many illnesses and never speaks badly of its colleagues.'

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New immune therapies combined with complementary-oncology measures

This is a time of great euphoria in the field of immunotherapy! New reports appear almost daily describing the success that can be achieved through this new pillar in cancer therapy. Cancer patients already derive benefit from these treatments. However, if the body's defence reactions are overactivated, serious side effects may occur, some patients even died from these new treatments. Nevertheless, there is no question that the new immunotherapies have opened new perspectives in cancer medicine.

Immunotherapeutic approaches, such as “checkpoint inhibitors”, antibodies against tumour antigens, or tumour vaccines, have the goal of strengthening the body's immune system and enabling it to attack and fight the tumour. Alongside surgery, chemotherapy and radiation, immunotherapies constitute the fourth pillar in cancer therapy.

The idea of using the immune system in the fight against cancer is not new. William B. Coley (1862-1936) had already demonstrated this principle over a century ago. One hundred years later, we know much better how the immune system works and how an immunological response against cancer cells can be mobilized, but many questions remain unresolved and clinical success is often still elusive. Simple immune stimulation is not a panacea for cancer, and can even trigger significant side effects in individual patients. Immunotherapy for cancer should be as specific as possible, targeting only the cancer cells. The delicate immunological balance between cancer immunity and immune tolerance should be maintained with these therapies, so that the immune response is not too violent and undesired autoimmune reactions do not occur.

Immunotherapies today are often used when traditional cancer treatments have failed. The success of immunotherapy against late-stage cancer depends on many factors. Highly toxic pre-treatments, which eradicate the immune cells along with the tumour cells, do not offer the best conditions for an effective immunological therapy. The biochemical milieu, or micro-environment, in the tumour tissue also plays an important role, since it frequently poses a barrier to successful immunotherapy. Increased lactate production through the fermentation process occurring in many cancer cells can generate an acidic environment that paralyzes immune cells. Tumour cells can also develop various strategies, known as escape mechanisms, to fend off immune cell attacks. Finally, the microbiome in the patient's gut can modulate an anti-cancer immune response and influence the environment in the tumour tissue. A loss of diversity in a patient’s intestinal flora and a predominance of harmful microbes are associated with a weakened immune response to cancer.

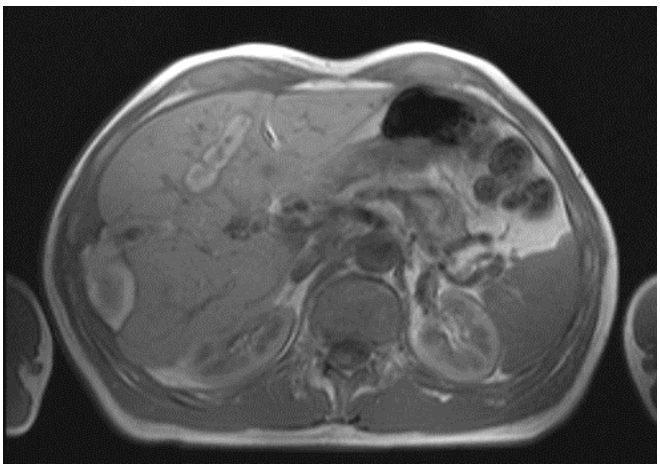
Complementary oncological therapy approaches can help (re)create an optimal microbiome and facilitate a targeted immune response against cancer by improving the micro-environment in the tumour tissue so that immune cells can overcome possible immunological barriers, including escape mechanisms from immune attack.

"Complementary oncological measures” and “integrative oncology" have become popular buzz words. From a small-town doctor's practice to renowned university hospitals – anyone, who feels important in oncology today, offers an integrative approach. However, this rarely goes beyond good intentions or paying lip service. This is unfortunate, since our many years of experience show that a truly integrative treatment approach can improve quality of life and life expectancy of seriously ill cancer patients. We feel that academic and complementary cancer medicine must work together closely to provide this opportunity to all cancer patients and find better treatment solutions. After our textbook "Integrative Oncology” was published in 2006 (ELSEVIER; ISBN: 978-3-437-56420-8), much has improved in terms of interdisciplinary cooperation for our patients and for us personally.

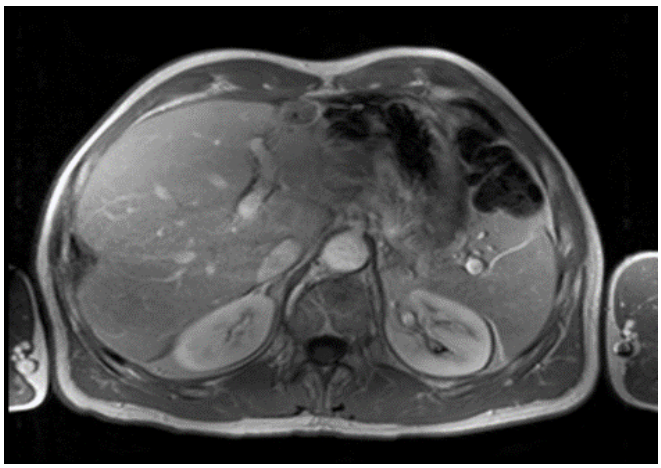
Today, we closely work together with oncologists, gynaecologists, immunologists and other specialists at home and abroad. Many academic oncology colleagues were able to see that complementary treatment protocols can provide benefits to their patients - including in the increasingly important area of solid tumour immunotherapy.

Professor Rupert Handgretinger and I have been working together for many years - combining complementary treatment protocols with leading-edge immunological therapies. We strongly believe that many of our patients have benefited from our interdisciplinary cooperation – either in terms of improving their quality of life, or their survival, or both. The following patient examples shall illustrate this:

T.CH. – a 53-year-old male patient from Switzerland saw his primary doctor in May 2006 with bowel movement problems and was diagnosed shortly thereafter with colon cancer and liver metastases. This condition carries a rather grim prognosis (less than 10% probability of living five years with this illness). The patient did not accept the toxic side effects of systemic chemotherapy and was searching for a 'gentler' treatment approach when he came to us for advice. Our complementary oncological treatment protocol initially consisted of locoregional hyperthermia for the liver lesions and our oral medication protocol for met-



MRI before LITT therapy 20/12/2006



Follow-up MRI after three years (19/10/2009)

astatic disease utilizing high-dose curcuminoids (Curcumin combi extra forte), proteoglycan (Aeskulap-CA statin), arabinoxylan (BioBran), milk thistle combined with quercetin (HEPASAN), and fermented wheat germ extract (AVEMAR). After a couple of weeks on this protocol, the patient increasingly felt more energetic and started to take pleasure in life again. His blood laboratory values improved within two months. At that time, the patient also started on a strict ketogenic diet in a cyclical fashion: two months on and two months off.

With the patient's overall condition improved, we suggested trans-arterial chemoembolization (TACE) treatment to bring his liver metastasis more quickly under control. This less toxic local chemotherapy significantly reduced the size of the liver metastases so that the remaining cancer lesions could be successfully destroyed with laser-induced thermo-therapy (LITT).

During and after this combined treatment, the patient did extremely well and was stable for the next four years. As a maintenance regimen, he continued to receive our immunotherapy (thymus extract and BioBran) in a cyclical manner. He was active, back at work, flew to Colorado every year to ski, and enjoyed an unrestricted quality of life. In April 2010, however, a follow-up CT scan showed several small lung lesions, and paratracheal and mediastinal lymph node enlargements for the first time. The patient's drug therapy was then expanded to include IMUSAN (a combination of medicinal herbs with immunological and anti-metastatic effects) and Aeskulap-MCP (modified citrus pectin), and was again applied consistently.

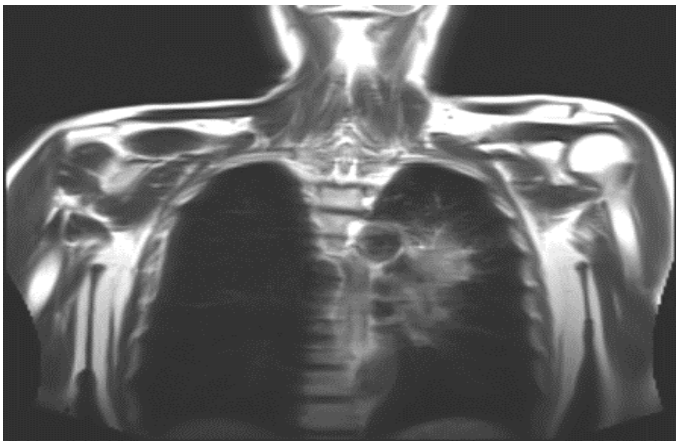
The patient was also successfully treated twice with regional chemoperfusion and subsequent thermal ablation of the lung lesions using microwave energy and LITT. After the destruction of the lung metastases by local therapy and under the expanded complementary medication regimen, a long-lasting remission was achieved. The patient felt excellent for the next six years: the liver and lungs were in full remission, no further metastases were observed, and he had a good quality of life, going skiing in Colorado every year. In early 2017, the patient unfortunately had a relapse with rapidly growing mediastinal metastases, from which he died in April 2017.

This example shows an 11-year survival of a patient with metastasized colon cancer. Complementary oncological treatments combined with immunotherapy and multiple radiological interventions using TACE and LITT had proven highly beneficial for this patient.

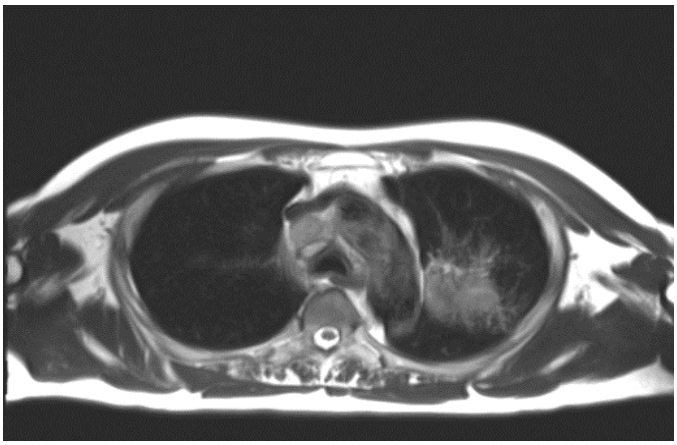
E.H. - a 63-year-old male patient from Los Angeles was diagnosed with metastasized bronchial cancer in September 2017 and declined palliative chemotherapy. The patient's primary tumour extended from the left hilar region into the upper lobe of his left lung for more than 5 cm. Comparative CT examinations showed that the cancer grew quickly and began to compress the left main bronchus. The patient began our complementary oncological treatment protocol based on daily infusion therapy with high-doses of curcumin, artesunate, vitamin C, coenzyme Q-10, and a proprietary haematoxylin/DMSO mixture, while also taking our oral medication protocol for metastatic cancer utilizing IMUSAN, Curcumin combi extra forte, artemisinin, Aeskulap-CA statin and Aeskulap-MCP.

Due to imminent compression of the left main bronchus by the rapidly growing tumour, our complementary treatments were then combined with regional chemoembolization (TACE).

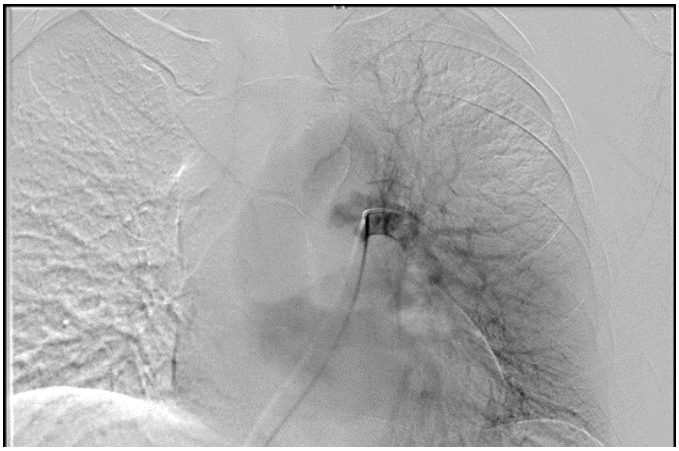
Over a period of two months, both the primary tumour and the lymphatic metastases subsided noticeably and the risk of bronchial compression was initially eliminated.



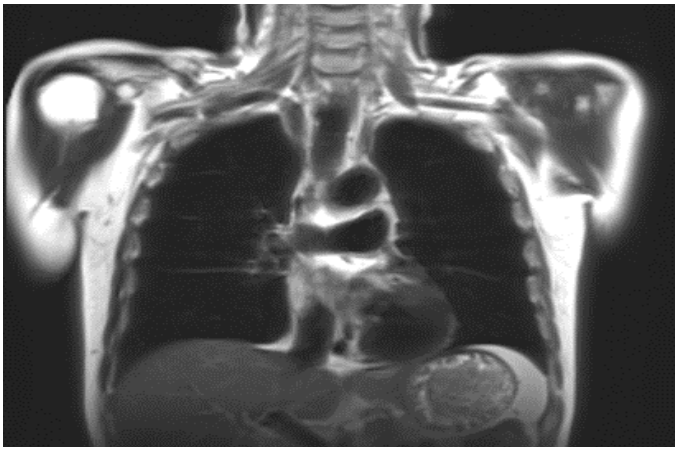
MRI before TACE 17/10/2017



MRI before TACE 17/10/2017



Angiography 17/10/2017



MRI from 5/2/2018

The patient tolerated the therapies well and experienced no significant impairments in his quality of life. His situation was stabilized by our treatment approach, and we hoped to keep the greatly reduced tumour mass under control and perhaps reduce it even further with immunological treatments utilizing a checkpoint inhibitor, NK cell therapy, and a peptide-based tumour vaccine. From January to August 2018, the patient received low-dose Keytruda (pembrolizumab, up to 150 mg every three weeks), a single treatment with autologous NK cell therapy (1.8 billion cells), and a peptide vaccine once monthly.

Despite these treatments, a follow-up PET-CT in the middle of August 2018 showed a slight increase in the primary tumour volume and some of the paratracheal lymph node metastases showed increased metabolic activity. This was rather disappointing as the immunotherapy treatments apparently failed to keep the cancer under control. For this reason, the patient received another TACE treatment, and we adjusted his oral medication and infusion protocol.

Despite therapy optimization, the patient developed a small left parietal brain metastasis in April 2019, which was successfully treated with precision radiation (gamma knife). Based on genetic studies using next-generation sequencing of the entire tumour cell genome, we have now recommended that the mutations found in the patient's tumour cells be addressed with targeted therapy and a higher dose of Keytruda.

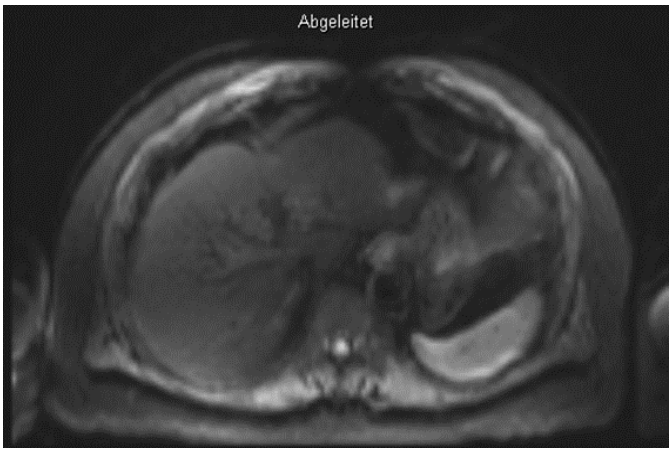
Under this combined treatment and the addition of an adjusted oral medication protocol, the patient stabilized again. Hopefully, this combined therapy approach will keep the patient's metastatic disease under control offering him more time with a good quality of life.

This example shows that complementary oncological measures combined with regional chemoembolization and immunotherapy were well suited to slow down rapid tumour growth and averting the risk of bronchial compression for this patient. By contrast, immunotherapy alone with low dose Keytruda was not able to stop disease progression, even though the patient's tumour cells were highly positive (90%) for the PD-L1 receptor.

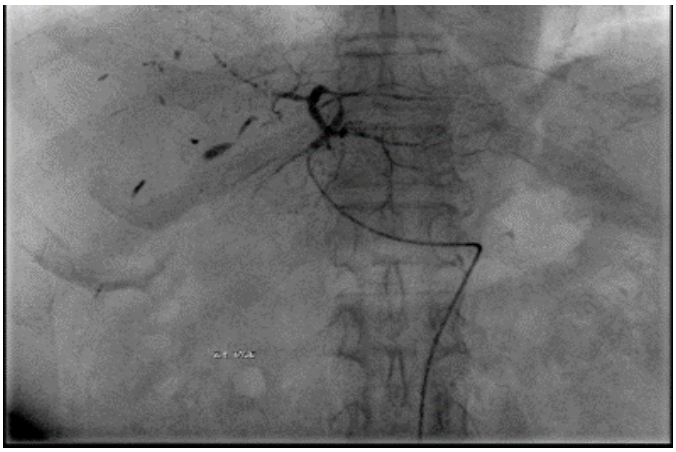
A. L. – a 78-year-old male patient from Jakarta was diagnosed with primary liver cancer in June 2016. His AFP level was far above 1000 ng/mL, and abdominal MRI showed a liver lesion in segment 2. The patient had a history of hepatitis C infection about 20 years ago, which was successfully treated with interferon. RT-PCR for viral load in 2018 showed no viral burden.

Known comorbidities included type 2 diabetes mellitus and prostate cancer that had been diagnosed the previous year and treated successfully with precision irradiation at the University Hospital in Zurich. The patient's primary liver cancer was first treated using our basic complementary oncological protocol. This consists of daily oral administration of IMUSAN, Curcumin combi extra forte, BioBran, quercetin and Aeskulap-CA-Statin. Parallel to this, our infusion therapy protocol with high-dose curcumin, artesunate, coenzyme Q-10, vita-min C and B complex, glutathione, and thymus extract was initiated. The patient tolerated these treatments very well. However, his AFP declined only by about 20% during this combined therapy. Therefore, we suggested additional local therapy directly to the liver lesion.

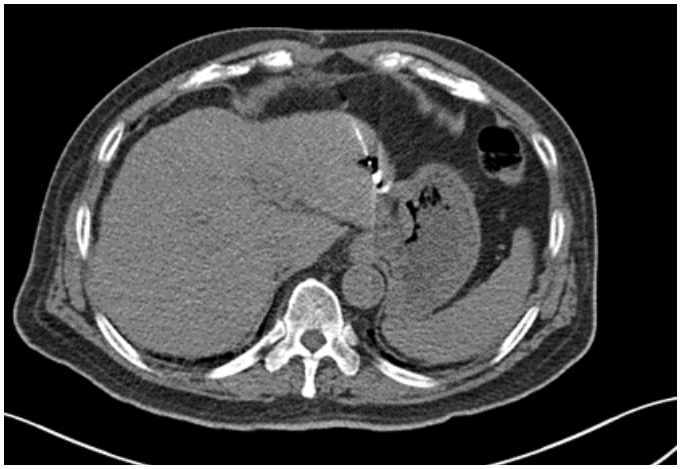
The patient received three TACE treatments of the affected liver segment and a subsequent RF ablation of the remaining hepatoma about 2 months later. This combined approach was very successful and reduced his AFP value to 0.6 ng/ml. Today, almost four years later, the patient is doing very well. His AFP is still in normal range (presently at 2.2 ng/ml), he continues to run his companies in Indonesia, travels frequently and is enjoying a full life.

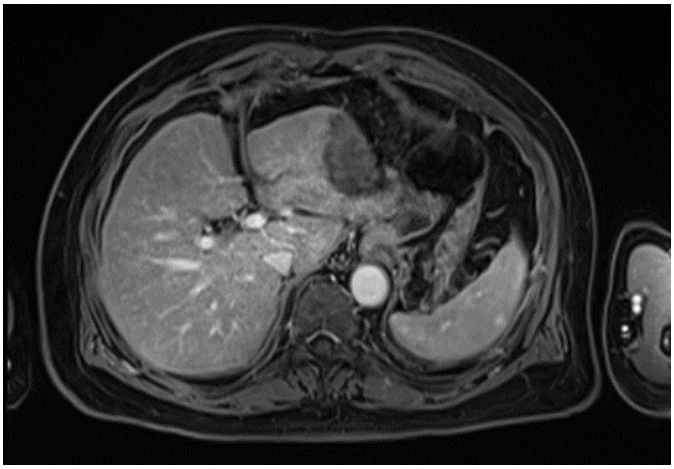


MRI before TACE on 4/10/2016


Angiography & TACE 22/11/2016

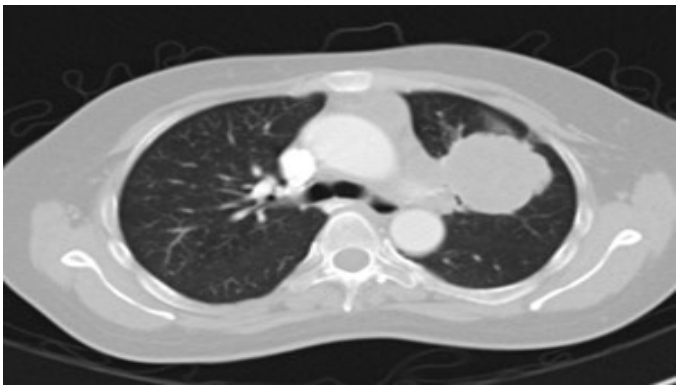
As a maintenance regimen, the patient receives infusion therapy 3 to 4 times a year, supplemented with immune system modulating medications like IMUSAN, BioBran, and HEPASAN.

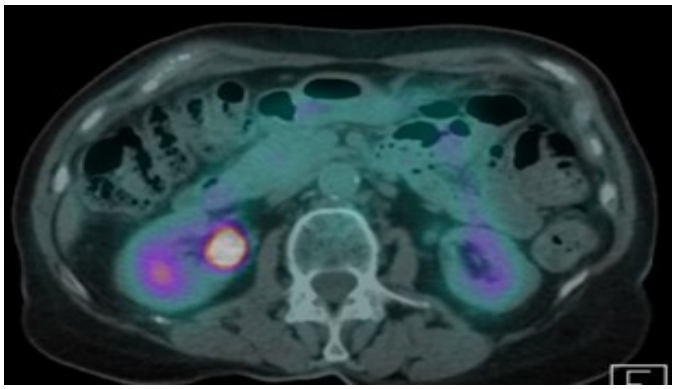

Microwave ablation on 10/1/2017


After microwave ablation on 10/1/2017

This example shows how TACE, followed by RF ablation in combination with a complementary oncological treatment protocol was successfully used to treat hepatocellular cancer in a patient with substantial comorbidities. Since this patient was not a candidate for liver surgery, one can assume that this combination therapy saved his life.

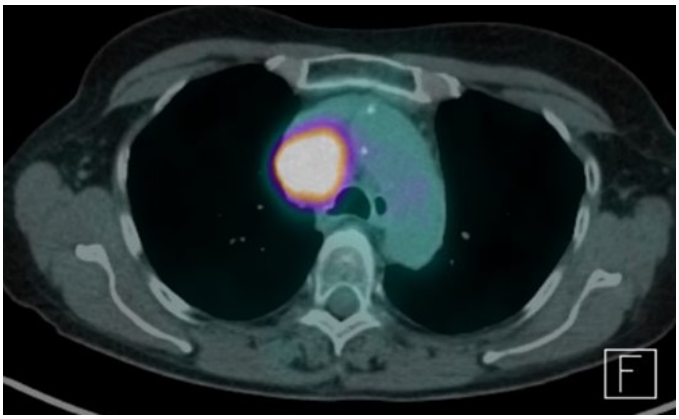
A.B. - a 73-year-old female patient from Singapore was diagnosed with a neuroendocrine-differentiated carcinoma of the lung in early 2015. The patient underwent surgery immediately following diagnosis and her left lower lung lobe was removed. Unfortunately, after 5 months, metastases appeared in the lymphatic system, the brain and the right adrenal gland.



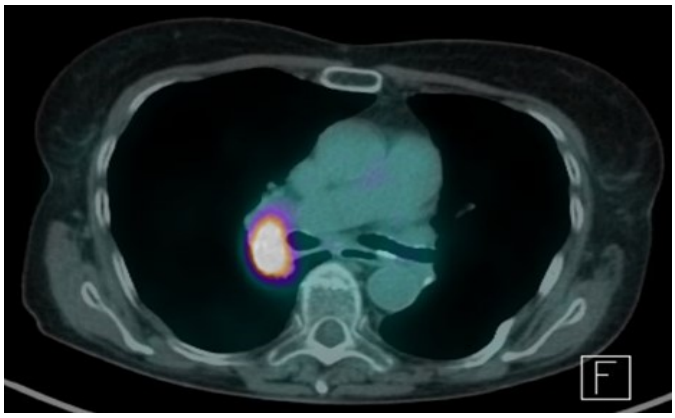


CT and PET CT images from April 2015

The patient came to Switzerland at the end of 2015 for a metastasectomy of the brain lesion. Shortly after surgery, she started on our oral medication protocol in the hope to reduce the toxic side effects of the concomitantly performed chemotherapy and stabilize the disease. The chemotherapy was discontinued after a few cycles due to intolerance, and immunotherapy was initiated with the PD-1 inhibitor, nivolumab (OPDIVO). Unfortunately, this led to extremely severe side effects after a few months and nearly killed the patient in the course of an auto-immune attack with hepatitis and pneumonia. Although the OPDIVO treatment was promptly discontinued, and glucocorticoid therapy as well as complementary treatment with HEPASAN for liver protection and BioBran for NK cell stimulation were started, the patient suffered organ damage and recovered only very slowly, experiencing severe fatigue for several months.



Paratracheal LN Metastasis

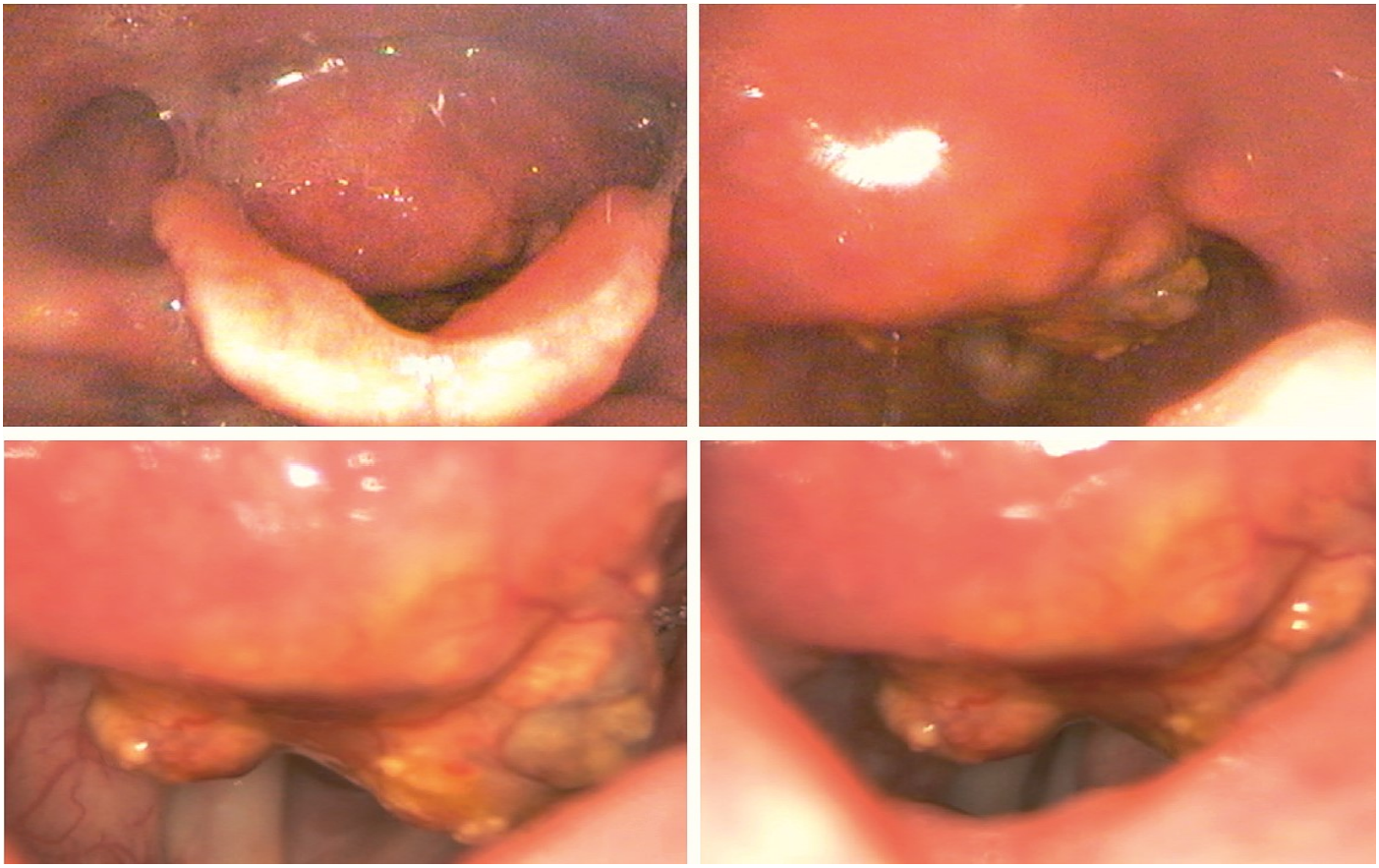


Parabronchial LN Metastasis

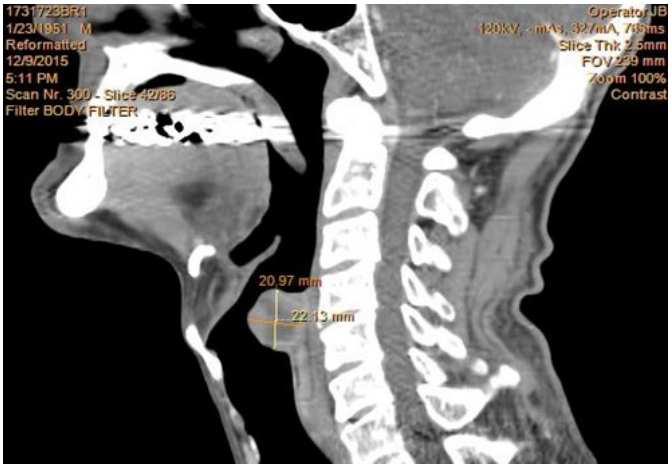
The patient's complementary oncological therapy was expanded with two anti-metastatic preparations, IMUSAN and modified citrus pectin. The patient tolerated this therapy well and was in stable condition, with a well-controlled illness for a little over a year. In October 2017, however, the lymphatic metastasis unfortunately progressed, and the patient ultimately died from her illness six months later.

This example shows that an over-activated immune system can cause serious autoimmune reactions with severe side effects and permanent organ damage. Under unfavourable circumstances those auto-immune attacks may even cause death due to treatment and not the underlying illness.

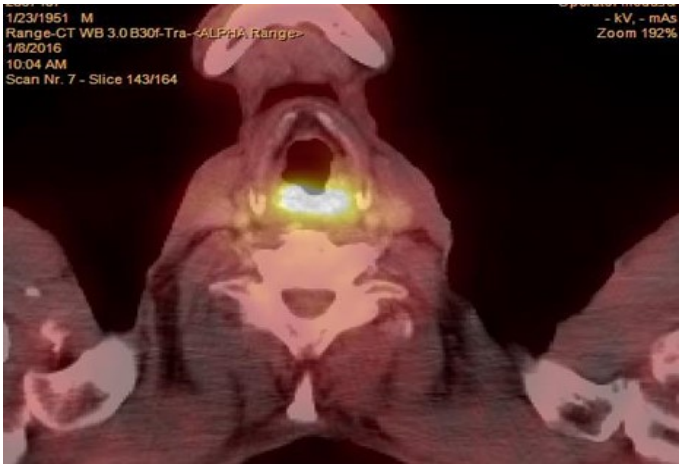
CH.A. - a 63-year-old male patient from Los Angeles was diagnosed with inflammatory sarcoma of the larynx in end of September 2015. Staging examination suggested a possible lung metastasis. The patient was scheduled for radical laryngectomy, possible lung metastasectomy and adjuvant chemoradiation therapy as needed at the Mayo Clinic in the USA.



Laryngoscopy before therapy



Sagittal laryngeal CT before therapy



Axial laryngeal PET-CT before therapy

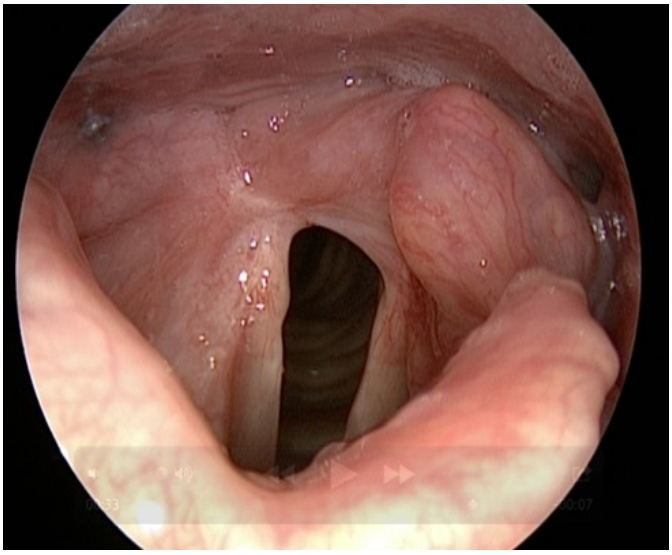
After much consideration, the patient first decided to undergo the debilitating surgery, but a last-minute intuition in the operating room on the day of surgery changed his mind.

He refused the proposed conventional treatment and walked out of the operating room fully prepped. The next day he was in a plane to Zurich requesting enrolment into our treatment protocol. The patient was first started on our infusion therapy protocol consisting of high-dose vitamin C, glutathione, artesunate, curcumin, coenzyme Q-10 and our proprietary haematoxylin/DMSO mixture, as well as a cyclical administration of high dose thymus extract.

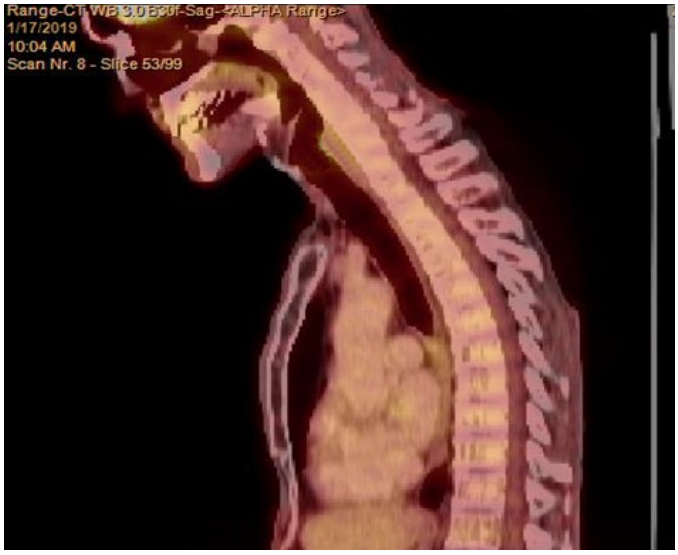
The patient combined this therapy with our oral basic medication regimen that included IMUSAN, quercetin, 4protection (green tea extract rich in epigallocatechin gallate) and

BioBran (arabinoxylan).

After four months of this intensive combined treatment regimen, a follow-up laryngoscopy and PET-CT examination showed no evidence of tumour in the larynx or anywhere else in the body. Currently, the patient situation remains stable after slightly more than four years.



Laryngoscopy image in early 2019



PET-CT image (sagittal plane) in early 2019

The patient continues our immunotherapy protocol with periodic autologous NK cell administration and a designer peptide vaccine. These are combined with immune system modulating oral medications, such as BioBran (2 g arabinoxylan per day) and IMUSAN. The patient has normal larynx function and currently no signs of cancer.

This patient responded very well to conservative treatment of his aggressive, inflammatory laryngeal sarcoma. Four and a half years after diagnosis, the patient still receives immunotherapy as well as anti-inflammatory and re-differentiating treatments. His larynx was preserved, he has no signs of cancer and enjoys a very good quality of life.

The patient examples presented here are intended to serve as an illustration that a combined therapeutic approach utilizing modern immunotherapeutic methods with complementary oncological measures can be advantageous for cancer patients, even in advanced stages of the disease.

The cancer immunity cycle

Immunotherapy is now established as the fourth pillar in cancer therapy, alongside tumour surgery, chemotherapy, and radiation. These new immune treatments can attack cancer cells on both, the cellular and humoral levels. Their goal is to create or facilitate a highly specific and balanced immune system response against cancer cells without invoking overzealous autoimmune attack of healthy cells. The cellular immune response against cancer, which is shown in Figure 1, can be divided into 7 steps according to Chen and Mellman (Daniel S. Chen and Ira Mellman: Oncology Meets Immunology: The Cancer Immunity Cycle. Immunity 39, July 25, 2013):

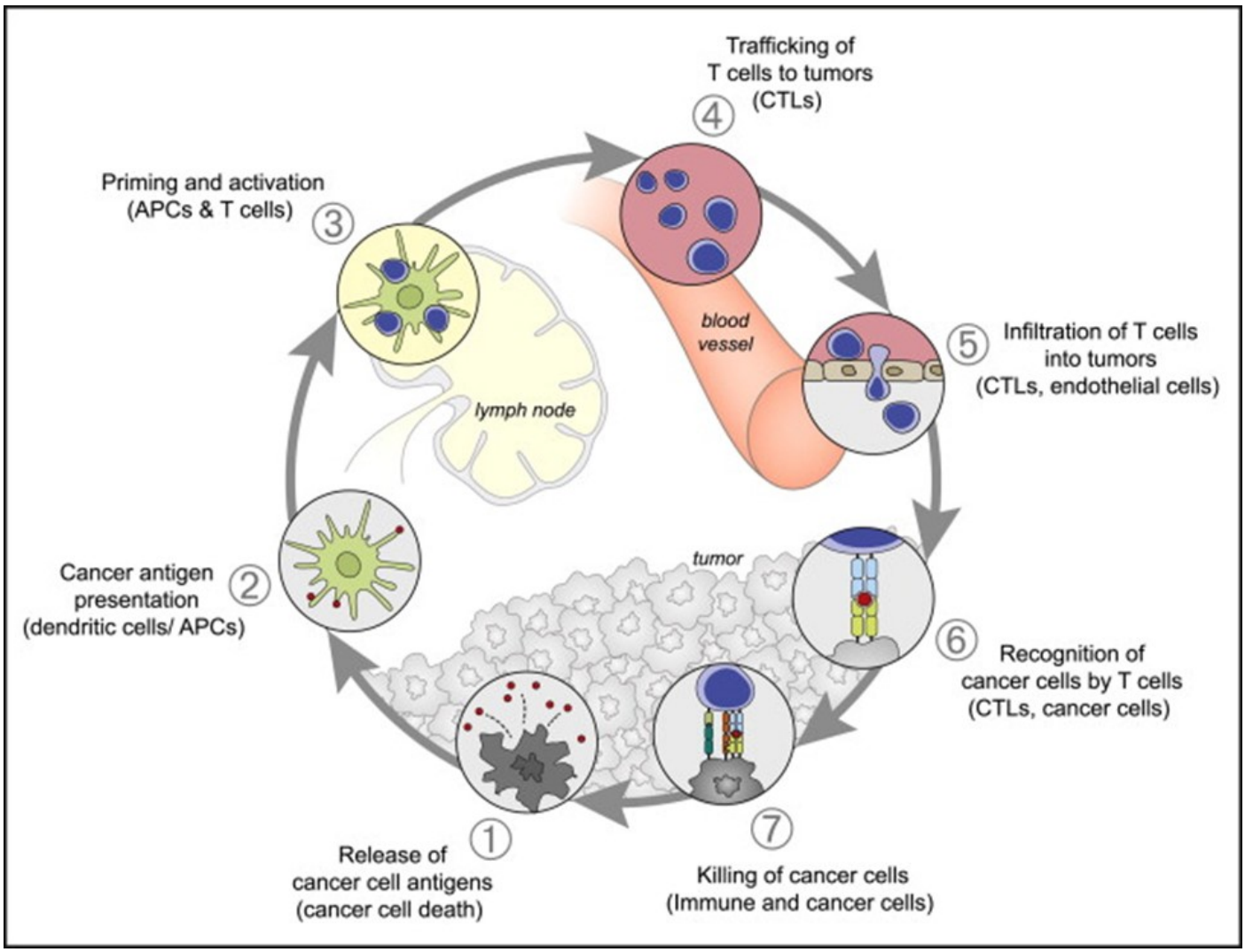


Figure 1: Cancer immunity cycle

The development of a clinically relevant immunity to cancer cells is a cyclical and (optimally) self-sustaining process, which leads to the accumulation of immune-stimulating factors which are ultimately intended to increase the T-cell attack on the tumour cells and thus to eliminate more tumour cells. Inhibitory factors also intervene in this cycle, which can attenuate or even halt the development of the desired tumour immunity via immunoregulating feedback mechanisms. The cycle can be divided into 7 stages, starting with the release of cancer cell antigens and ending with the destruction of cancer cells. Shown here are the individual steps of the immune cycle, the cells involved and the anatomical structures of the immune response.
Abbreviations: APCs = antigen-presenting cells; CTLs = cytotoxic T lymphocytes.

In the first step of the cancer immunity cycle, neoantigens are released from the tumour cells and taken up, processed, and presented by dendritic cells (DCs). Immunogenic signals (e.g. pro-inflammatory cytokines and stimulating factors from dead tumour cells or from the intestinal microbiome) help to steer the immune response in the direction of tumour immunity vs. tumour tolerance.

In the second step, the DCs present the processed neoantigens on MHC-I and MHC-II class molecules to the T-cells, which leads to what is termed "priming" and activation of the effector T-cells, which then launche a specific immune response against cells exhibiting the neoantigen (third step).

The outcome of the immune response is determined at this point by the critical balance between effector T-cells and regulatory T-cells. If the regulatory T-cells are in the majority, the development of immunity to the tumour can switch to a development of tolerance. In the fourth step, the activated effector T-cells leave the lymph nodes and are transported to the tumour tissue via the bloodstream. In step 5, the effector T-cells infiltrate into the tumour tissue and recognize those cancer cells that express the neoantigen on their cell surface.

The effector T-cells then dock onto these cancer cells via what is termed the T-cell receptor (step 6) and destroy the target cell (step 7). The destruction of cancer cells then releases further neoantigens, which can then restart the cycle and, in the ideal case, continue until all cancer cells are eliminated.

Unfortunately, this usually doesn't work so smoothly for each cancer patient. There are many reasons for this: Tumour antigens are either not recognized, or the DCs and T-cells consider neoantigens as “self”, create regulatory T-cells instead of effector T-cells, and thus initiate immune tolerance instead of immunity.

T-cells might not be able to reach the tumour at all, or might not be effective since the tumour milieu is enriched with

lactate through the cancer's own metabolism (acidic milieu), or factors from the tumour itself and from the tumour's micro-environment might suppress the action of the effector T-cells. Tumour internal regulatory T-cells, macrophages and myeloid suppressor cells, are the most important sources of these inhibitory influences.

By its nature, designing this delicate balance of stimulating and inhibiting factors in the cancer immunity cycle in such a way that cancer immunity arises while autoimmunity does not occur is an "immunological balancing act" that is rarely successfully achieved.

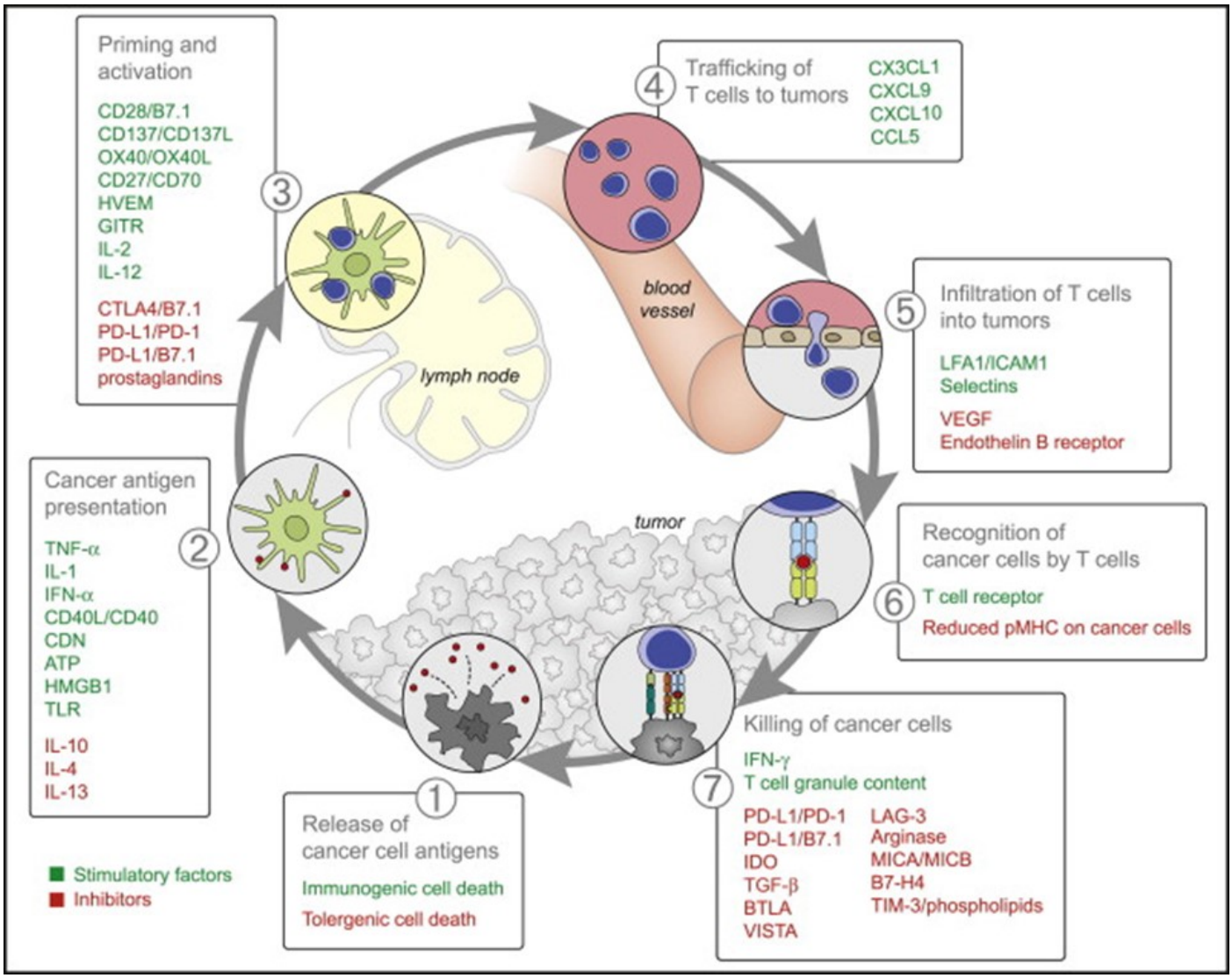


Figure 2: Stimulating and inhibiting factors in the cancer immunity cycle

Every step in the cancer immunization cycle requires the coordination of numerous factors, both stimulating and inhibitory. Stimulating factors (in green) promote the development of immunity, while inhibiting factors (in red) keep the immune response under control so that an excessive immune response doesn't arise in terms of autoimmunity. Immune checkpoint proteins, such as CTLA4, can inhibit the development of an active immune response by intervening primarily at the level of T-cell development and proliferation (step 3). By contrast, the PD-L1 receptor is more inhibitory or modulating in the tumour bed (step 7). Abbreviations: IL: interleukin; TNF: tumour necrosis factor; IFN: interferon; CDN: cyclic dinucleotides; ATP: adenosine triphosphate; HMGB1: high mobility group of protein B1; TLR: Toll-like receptor; HVEM: herpes virus admission mediator; GITR: glucocorticoid-induced TNFR family-related gene; CTLA4: cytotoxic T lymphocyte antigen-4; PD-L1: transmembrane protein (CD274 molecule); CXCL/CCL: signal proteins; LFA1: lymphocyte function associated antigen-1; ICAM1: intracellular adhesion molecule 1; VEGF: vascular endothelial growth factor; IDO: indolamine 2,3-dioxygenase; TGF: transforming growth factor; BTLA: B and T lymphocyte regulator; VISTA: V-domain of Ig suppressors for T-cell activation; LAG-3: lymphocyte activation gene 3 protein; MIC: MHC Class I polypeptide related sequence proteins; TIM-3: T-cell immunoglobulin domain and mucin domain-3.

Figure 2 shows the various stimulating and inhibitory factors that play a role in the cancer immunity cycle. When cancer cells die, the decay products can be either immunogenic or tolerogenic. In the latter case, the cycle will not even be stimulated, and an immune response is not to be expected.

However, if neoantigens from the dying cancer cells are immunogenic, the cycle is launched and the stimulating factors (e.g., TNF-alpha, IL-1, interferon alpha) lead to antigen presentation by the antigen-presenting cells (e.g., DCs) and continue to bind to and activate the effector T-cells in

the lymphoid tissue unless prevented from doing so by inhibiting factors, such as IL-10, IL-4, prostaglandins, or CTLA 4 and PD-L1/PD-1. If the activated effector T cells can reach and infiltrate the tumour and this step is not inhibited by vascular endothelial growth factors (VEGF), then at least the cancer cell attack pathway is free for the effector T-cells. The last step in the cancer immunity cycle then depends on a sufficiently high interferon gamma concentration, but can still fail due to inhibition by PD-L1 and PD-1 receptors and some other inhibitory factors (step 7).

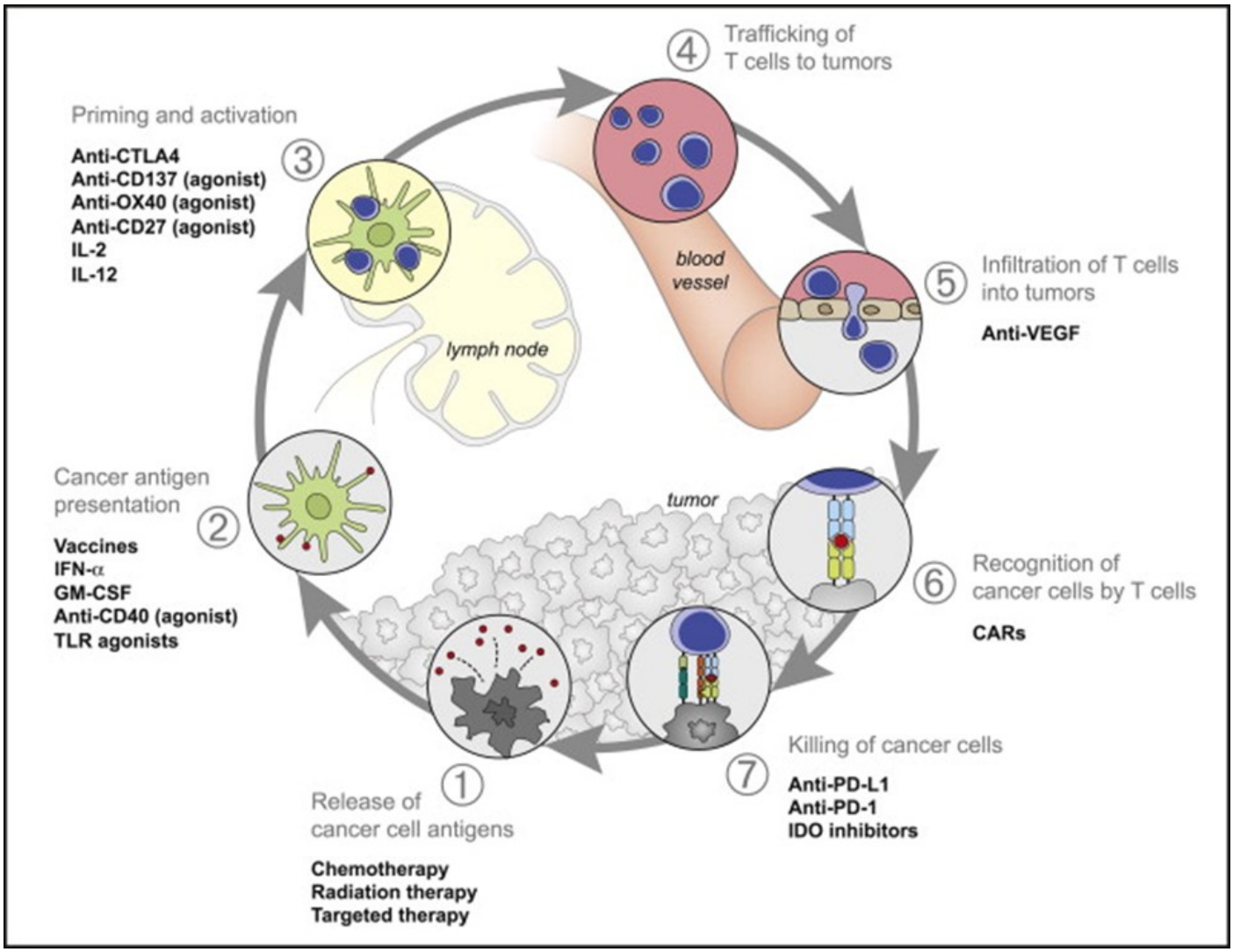


Figure 3: Therapies that can positively affect the cancer immunity cycle

The various factors that play a role in the cancer immunity cycle are the targets of various treatments, including immunotherapy. Examples of immunotherapy that are currently in pre-clinical and clinical trials are listed. Vaccines can primarily stimulate step 2 of the cycle, anti-CTLA4 ligands promote step 3, and anti-PD-L1 or anti-PD-1 antibodies will give a boost in step 7. Toxic treatments including chemotherapy, radiation, and targeted therapies can stimulate step 1, while VEGF inhibitors can support T-cell infiltration into the tumour (step 5).
Abbreviations: GM-CSF = granulocyte macrophage colony stimulating factor; CARs = chimeric antigen receptors.

Figure 3 lists the various cancer therapies, including immunotherapy within the cancer immunity cycle. Through their cytotoxic effects, chemotherapy, radiation and targeted therapies can release neoantigens (step 1), which are required for the activation of the cancer immunity cycle.

The presentation of the neoantigens by the DCs (step 2) can be improved by administration of interferon alpha, GM-CSF and "Toll-like" receptor agonists (e.g. imiquimod), as well as vaccination therapies. The process of binding and activating of effector T-cells can be increased by treatment with anti-CTLA4 (e.g. ipilimumab) or antibody therapy against the CD-27 receptor (step 3).

To improve of effector T-cells infiltration into the tumour tissue, anti-VEGF medications, e.g. bevacizumab (step 5), may be used. Improving detection of cancer cells by the effector T-cells is being tried in the clinic by introducing a

chimeric antigen receptor (CAR) generated through genetic manipulation (step 6).

Finally, the killing of cancer cells can then be intensified in the last step of the cancer immunity cycle by immunotherapy with the check point inhibitors nivolumab or pembrolizumab (anti-PD-1) and avelumab or atezolizumab (anti-PD-L1).

Immunotherapy - a critical evaluation and outlook

The introduction of immunotherapy has surely brought us to the beginning of a new era in cancer medicine. At present, we still know far too little about the complex processes that control and influence the immune response to cancer, but successes have already been achieved that oncologists of past decades could only dream of achieving with conventional therapy methods.

In particular, immunotherapy has already improved the chances for patients with malignant melanoma, renal cell carcinoma and non-small cell lung cancer. The mean survival time of 6-8 months for metastatic melanoma was significantly increased by 3 to 5 times through immunotherapy using the CTLA-4 inhibitor, ipilimumab (approved in 2011), or the PD-1 inhibitor, nivolumab (approved in 2014).

The combination of both checkpoint inhibitors can offer even more survival time, but the side effects from combined checkpoint inhibition are also more severe. The success of treatment with checkpoint inhibitors in patients with renal cell carcinoma and non-small cell lung cancer has also been improved. For example, compared to the second line chemotherapy with docetaxel, nivolumab therapy in renal cell carcinoma patients yielded an average life extension of 5-6 months, and 3-4 months in lung cancer patients.

With Hodgkin's disease, a less common lymphoid cancer, there have been even more dramatic improvements with immunotherapy in patients who experienced a relapse or achieved no response to standard chemotherapy.

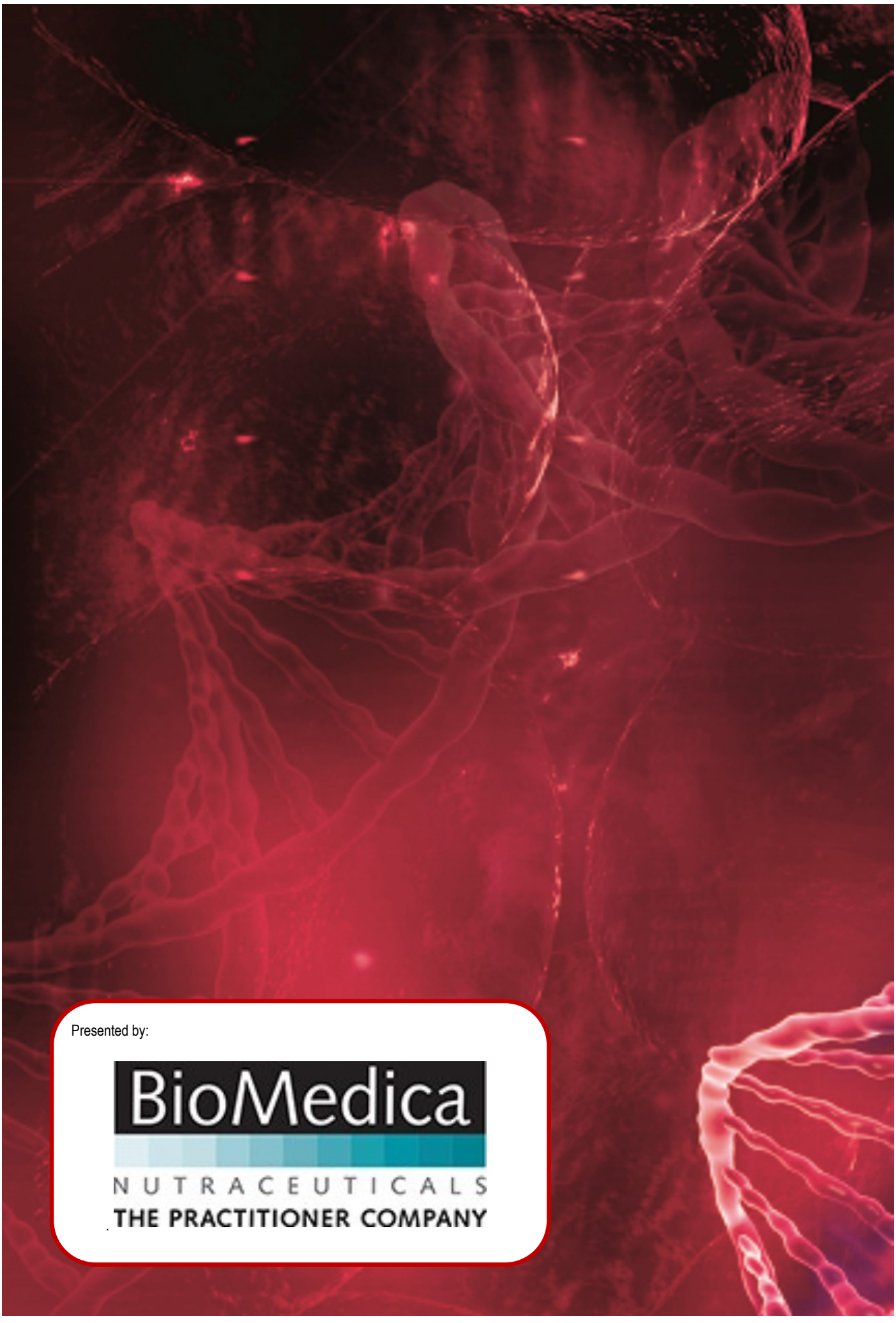
Despite all the success, check-point inhibitor treatment too often amounts to nothing for an individual patient, and ultimately may cause only burdening side effects and high treatment costs. Some cancers, such as pancreatic and colon tumours, do not seem to respond to the new drugs at all.

The reasons why only about every 4th patient derives benefit from immunotherapy is still largely unclear. Because the high costs of immunotherapy (between 5 to 50 thousand USD per month of treatment!), it is important to determine which patients can benefit from immunotherapy and which cannot. There are no reliable clinical parameters yet to predict good response.

We also need to find optimal therapeutic doses of individual immunotherapies, determine the most effective interval for their use and how to better manage the side effects that occur. Too often, these treatments result in excessive immune reaction causing autoimmune disease from which patients do not recover readily after stopping the immune-activating medication.

Therefore, this type of cancer therapy should only be practised by experienced specialists who can recognize and interpret side effects early and initiate counter measures before organ damage occurs.

Ultimately, immunotherapy drug manufacturers and health insurers must share responsibility and guarantee that these therapies are priced appropriately to ensure that they are accessible to any cancer patient who is in need.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