

This is the basis of our investigations with Mr. Leszlauer's patented apparatus, the Cancer Detector.

It gives you real data about the malignancy of a given area within some seconds. The method is cheap.

The electrolyte of the tissues and the bodily fluids, especially the Na and the K ions, touching the surface of the patented electrode, generate galvanic current. The Cancer Detector measures its microampere level.

We do not need to give the patient electric current, chemicals or stain to get the results.

The measurement can be made on biopsy material or on other removed tissues, even on corpses, too. This shows that this is not a bioelectric phenomenon.

When you put the excised material into a wet chamber (a jar, covered with cotton or gauze wetted with tap water), you can get typical levels even several hours after the excision.

The mostly used flexible probe works with a blunt tip. It is disposable. It is 20 - 200 cm long; its diameter is 2 mm. The probe can be used through a flexible or rigid endoscope, too.

Another type is the needle electrode to check the tissues in the depth, through the skin or scars even during operations.

Both of the probes (with the blunt tip and the needle) and also the connecting cables can be sterilised in ethylenoxide.

The probe is disposable. The first cause of it is that the active electrode will be used up; on the other hand, according to the hygienic rules, the plastic material must not be sterilised again.

It is very important that the probes measure only the cells, fluids etc., which are in direct contact with the surface of the probe. For this reason it may be, that below the normal cells, there are tumour cells. This is the cause, that you must take the spots with the high level into account.

The probe should be put with gentle pressure at right angle with its full surface without moving – on the tissues.

For I am an otolaryngologist, I did the investigations mostly on Ear-Nose-and Throat patients, according to the rules of the WHO.

With a gynaecologist we made some vaginal investigations, too.

In most of the cases histological examinations were made before or after our electronic measurements with the Cancer Detector in double-blind test, i.e. neither they, nor we knew the results of the other.

Touching the tissue surface, or at lifting of the probe, sometimes you get a sharp high peak level, which decreases rapidly. This has an electrochemical cause. You should only take the 3-10 seconds long stabilized levels into account.

In case of a suspected tumour the measurement should be made in the active zone, usually on its edge, or if it is pedunculated, at the peduncle.

At necrotic or scarred areas the μ A values may be lower than the usual ones for malignant tumours, so you can be led to false conclusions.

2-3 mm from the edge of the tumour, on the normal tissues you get normal levels.

According to our investigations, it is highly probable that **in case of malignant tumours the results of the measurements are characteristically high, usually 30 - 60 μ A.**

Other fast dividing cells, e.g. active granulation can give high μ A results, too, but this is reversible in some days. The slower dividing ones, the normal, the ones with inflammation, ulceration, and hypertrophy, as well as benign tumours usually give values below 20 μ A.

Tissues surfaces evaporated by Laser light, coagulated or cut with the diathermic knife give high μ A levels for some days.

Pus, discharge gives high levels. These should be removed from the surface with sucking, gentle swabbing or perhaps rinsing with tap water. Thereafter you can get the real μ A level. (Rinsing with NaCl solution would give high level.)

Mucus, debris, oils or ointment should be removed, too.

The movement of the electrode on the surface e.g. that of the mucous membrane of the throat at the swallowing reflexes does not give a stable line. Anaesthesia helps in these cases.

Local anaesthetics (like 1 % Lidocain, 10 % alcoholic solution of Lidocain) **or narcosis do not influence the measurements.** Blood on the surface can also disturb the results; the line sometimes becomes saw - toothed.

The measurements with the Cancer Detector show (within some seconds, with a very great probability) whether the transformed tissue is a malignant tumour, e.g. a cancer or not.

First you should check the reference level of the normal tissues mostly on the mucosa of the bucca. It is usually 6 - 10 μ A.

If there is tumour, necrosis, inflammation, debris orpus in the mouth e.g. in patients with false teeth, the mouth should be rinsed with tap water.

The reference level can be checked even on other healthy tissues, but the measurement of the transformed tissue is even valid without the reference level.

Before the measurement starts, the tip of the probe should be wiped with propylalcohol. You may touch the tissue only after this, otherwise you will get false results.

After finishing the measurement on the different spots, especially when you got high μ A levels in case of tumour, or pus, before testing the next spot, the probe should be wiped with tap water, and perhaps with propylalcohol, too because remained rest electrolytes give false levels.

In case of measurements with the probe the tissue surface should not be dry or covered with crust or scar. These give only false low levels.

The keratotic outer layer of the skin gives no μ A level at all.

The crust can be removed even mechanically.

Should the tumour be covered with a thick keratotic layer or with scar, you can only get the characteristic high levels for tumour if the probe is pushed into the active part of the tumour or if the deeper layers of it are pricked with a needle electrode.

In all probability, it would be a highly valuable method to judge the expansion of the tumour, the possible lymph node metastases and the performance of the ablatic operation during the operation itself.

The measurement with the Cancer Detector can reduce the number of the frozen sections, and this reduces the time of the operation, the narcosis and even much of the expenses.

The histologist can use this method, too to decide which part of the operatively removed organ he should choose for his histological slides in order to check whether or not the tumour has exceeded its border.

The Cancer Detector can give you valuable results about the efficiency of the radio - or chemotherapy and can show the probable recurrence at any early stage.

If during or after the telecobalt irradiation or chemotherapy there are signs of improvement or recovery, the values at the tumour decrease significantly. Occasionally we did not get lower values at some part of the tumour; later it usually turned out that at these areas developed a recurrence.

However, the number of our investigations and the time relapsed are not enough for us to be able to predict the probability of a later recurrence of the cancer or whether a questionable transformation would become malignant or not.

Personal and medical data can be entered in the computer part of the Cancer Detector and can be processed like in another computer.

A part of the investigated patients were processed in details

Description	Number		
	All	Maximal current levels $\geq 30\mu\text{A}$	
Otolaryngological cancers (maximal levels)	117	115	98,2%
Other measured spots on these tumours	247	212	85,8%
Necrotic part	19	1	5,2%
Normal tissue	204	0	0%
Acute or chronic inflammation after suction	178	8	4,44%
Granulation	36	0	
Pus, discharge	56	27	

(The details of this table are found in the attached Excel file. (Carcinoma ceratosum.xls))

CONCLUSIONS

The new electronic equipment "Cancer Detector LEC - 03" is in all probability suitable for giving data about the malignancy of a given area in a very quick, cheap, and reliable way.

In case of uncertain alterations it helps you with your decision about the correct time of the necessary control examination, the probably necessary additional examinations, and - if required - the correct place of the biopsy.

The new method can be used with rigid or fiber-endoscopes, too, and can give very important data at laparoscopic or other endoscopic operations.

In all probability, it would be a highly valuable method of investigation as to the judgement of the expansion of the tumour, the possible lymph node metastases, and the performance of the ablative operation during the operation itself.

The histologist can use this method to decide about which part of the operatively removed organ he should take his histological slides to check whether or not the tumour has exceeded its border.

It can give you valuable results about the effectiveness of the radio - or chemotherapy and can show the probable recurrence at an early stage.

In spite of the accuracy of the practically 98 percent definite diagnosis, other investigations (e.g. special histological or histochemical ones) should be made before choosing the correct therapy, too.

References:

1. **CONE, C. D., Jr. 1971.** Unified theory on the basic mechanism of normal mitotic and oncogenesis. *J. Theor. Biol.* 30:151-181.
2. **CAMERON, I. L., and N. K. R. SMITH, 1980.** Energy dispersive X-ray microanalysis of the concentration of elements in relation to cell reproduction in normal and in cancer cells. *Scanning Electron Microsc.* 2:463-474.
3. **CAMERON, I. L., N. K. R. SMITH, T. B. POOL, and R. L. SPEARKS: 1980.** Intracellular concentration of sodium and other elements are related to mitogenesis and oncogenesis in vivo. *Cancer Res.* 40:1493-1500.
4. **CAMERON, I. L. and NANCY K. R. SMITH:** Energy dispersive spectroscopy in the study of the ionic regulation of growth in normal and tumor cells. *Ions, Cell Prolife*4.
5. **CAMERON, I. L. and K. E. HUNTER, 1983.** Effect of Cancer Cachexia and Amiloride Treatment on the Intracellular Sodium Content in Tissue Cells. *Cancer Res.* 43:1074-1078
6. **CAMERON, I. L. N. K. R. SMITH:** Distribution of Potassium and Other Elements in Living Cells as studied by Electron-probe X-ray Microanalysis The physical aspects of the living cell. 145-163
7. **SMITH J. B. and E. ROSENGURT, 1978.** Serum stimulates the Na⁺ K⁺ pump in quiescent fibroblasts by increasing Na⁺ entry. *Proc Natl. Acad. Sci. U.S.A.* 75:5560-5564
8. **SMITH N. R., R. L. SPEARKS, T. B. POOL and I. R. CAMERON, 1978.** Differences in the intracellular concentration of elements in normal cancerous liver cells as determined by X-ray microanalysis *Cancer Res.* 38:1952-1959
9. **ZS. NAGY I., C. PIERI, C. GIULI, C. BERTONI-FREDDARI and V. ZS. NAGY, 1977.** Energy dispersive X-ray microanalysis of the electrolytes in biological bulk specimen. I. Specimen preparation, beam penetration and quantitative analysis. *J. Ultrastruct. Res.* 58:23-33
10. **ZS. NAGY I., LUSTYIK G., ZS. NAGY V., ZARÁDI B., BERTONI-FREDDARI:** Intracellular Na⁺ : K⁺ ratios in human cancer cells as revealed by energy dispersive X-ray microanalysis. *The Journal of Cell Biology* 90, 769-777, 1981.
11. **ZS. NAGY I., GY. LUSTYIK, G. LUKÁCS, V. ZS. NAGY, and GY. BALÁZS:** Correlation of Malignancy with the Intracellular Na⁺ : K⁺ Ratio in Human Thyroid Tumors. *Cancer Res.* 43:5395-5402. 1983.
12. **TÓTH L., LAMPÉ I., SZÁLLÁSI Z. és ZS. NAGY I., 1986.** Gégetumorok intracelluláris Na⁺ : K⁺arányának meghatározása energia-diszperzív röntgen-mikroanalízissel. *Fül-orr-gégyógyászat.* 32:229-234. 1986.

Number	Carcinoma planocell clinically	II.				
		mean	median	stand.dev maximal	maximal	minimal
	56 maximal tumor levels	47,9	44,5	13	80	30
	185 other tumor levels	38,1	36	10	78	22
	19 necrotic part of tumor	24,5	25	4,5	32	15
	16 granulation	18	20	7,3	28	1
	115 normal tissue	16,2	17	6,5	32	3
	40 sample	10,1	10	3,8	18	3

Carcinoma basocell.

Number	clinically	mean	median	stand.dev.	maximal	minimal
	24 maximal tumor level	34,8	35	4,9	45	28
	42 other tumor levels	28,8	30	6,1	40	15

4 necrotic part of tumor	20,8	20	1,5	23	20
18 normal tissue	13,7	13	3,8	20	8
4 sample	9,9	10	3,2	15	4

Other ORL. cancers

Number	clinically	mean	median	stand.dev.	maximal	minimal
11	maximal tumor level	42,7	40	10	60	30
25	other tumor level	35,3	35	7,9	52	22
5	necrotic part of tumor	23	23	3,6	28	18
30	normal tissue	15,3	6,5	4,9	18	3
3	scar	16,7	16	1,1	19	16
9	sample	10,1	12	5,3	19	3

Operated, irradiated, but not heald cancers

Number	clinically	mean	median	stand.dev.	maximal	minimal
27	maximal tumor levels	42	40	12,5	80	24
48	other part of tumor level	36,4	34	10,4	70	22
26	necrotic part of tumor	21	18,5	10,4	60	7
5	granulation	15,4	17	4,3	19	9
3	scar	2,6	3	0,5	3	2
62	normal tissue	14,7	13,3	5,6	26	4
26	sample	11,1	11	4,1	20	3

Site of the healed earlier operated or irradiated ORL cancers

Number	clinically	mean	median	stand.dev.	maximal	minimal
27	site of earlier ORL tumor	15,8	17	5,5	25	3
11	normal tissue	12	13	5,4	19	3
3	sample	10,2	10,5	2,9	14	6

Clinically malignant tumor suspect, but histologically benign

Number	clinically	mean	median	stand.dev.	maximal	minimal
13	maximal levels	22	22	3,3	28	18
45	other suspect levels	16,6	16	4	25	8
11	2-3 mm from suspect	17,4	16,5	5,1	18	10
7	sample	10	12	4,4	17	5

Acute and chronic granulations

Number	clinically	mean	median	stand.dev.	maximal	minimal
31	acute granulation	31,1	30	10,8	55	127
55	chronic granulation	16,7	16,5	5,6	30	

Acute inflammation

Number	clinically	mean	median	stand.dev.	maximal	minimal
13	maximal levels	19,7	20	7,1	28	4
34	other levels	15,5	15,5	5,7	28	3
4	pus	33	35	6,2	38	24
13	sample	9	9	3,7	15	2

Chronic inflammation

Number	clinically	mean	median	stand.dev.	maximal	minimal
12	maximal levels	13,8	14	3,9	20	9
15	other levels	8,7	10	3,3	15	3
2	sample	14,3	6	6	20	8

Pus and mucopurulent discharge

Number	clinically	mean	median	stand.dev.	maximal	minimal
16	pus over the cancer	45,7	40	17,6	70	
46	pus without cancer	38,1	36	12,6	70	

Polyps before and after suction of the discharge

Number	clinically	mean	median	stand.dev.	maximal	minimal
21	before suction	41,2	38	15,3	70	17
36	after suction	24,3	23,5	7,9	40	8
2	normal tissue	8	8	0	8	8
4	sample	10	10,5	3,6	13	6

Chronic rhinitis before and after suction of the mucopurulent discharge

Number	clinically	mean	median	stand.dev.	maximal	minimal
17	mucopurulent disch.	35,2	26	13,2	70	16
9	maximal level after suction	26	22	7,6	40	16

8

26 other levels after suction	22,6	32	7,1	38	8
3 sample	9	8	3,6	13	6