DNA fecale e Composti Organici Volatili. Ipotesi o Possibilità?

GISCoR22

Il sottoscritto Stefano Rapi

ai sensi dell'art. 3.3 sul Conflitto di Interessi, pag. 17 del Reg. Applicativo dell'Accordo Stato-Regione del 5 novembre 2009,

Dichiara:

X *che negli ultimi due anni NON ha avuto rapporti diretti di finanziamento con soggetti portatori di interessi commerciali in campo sanitario:*

Stefano Rapi

DNA Fecale: congressi di Napoli e Firenze

Tumore colon-retto, arriva il primo test per lo screening basato sulla tecnologia del dna fecale

Autore: Redazione **24 Novembre 2015**

Roma - Exact Sciences Corp., ha annunciato che Cologuard, primo e unico test basato sulla tecnologia del DNA fecale per lo screening del tumore colon-retto, ha ricevuto il marchio CE ed è disponibile per il mercato italiano.

“Il test, che sarà presentato nell’ambito del congresso nazionale GISCoR (Gruppo Italiano Screening Colorettale) in corso a Napoli, è già in commercio negli USA e in Gran Bretagna, …
Prevediamo di coprire tutto il Paese entro il 2016”, ha dichiarato il dr Mauro Scimia, Regional Business Manager Italia e Spagna.

Cologuard è incluso nelle linee guida per lo screening del tumore colon-retto della American Cancer Society e l’analisi con DNA fecale nello U.S. Multi-Society Task Force on Colorectal Cancer.

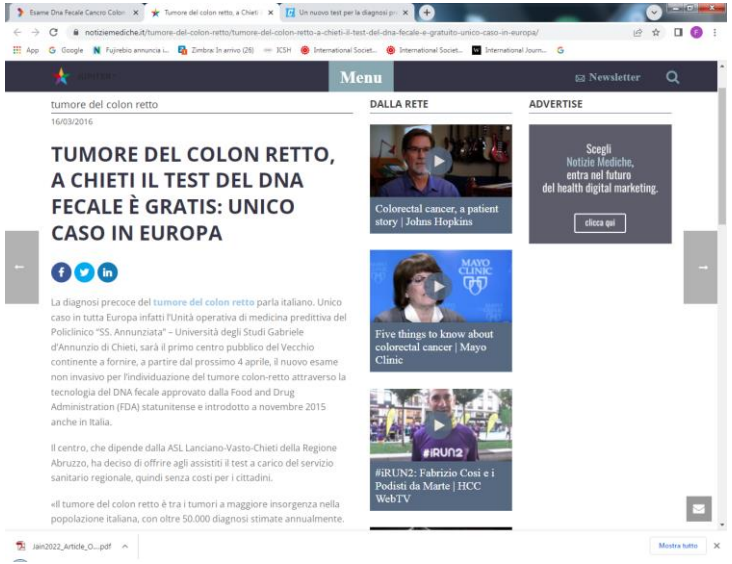
Il test, indicato per tutte le persone a rischio intermedio tra i 50 e gli 84 anni, rappresenta una reale innovazione, in quanto permette l’analisi del DNA fecale combinata a quella di marcatori ematici (emoglobina) normalmente inclusi nel test per la ricerca del sangue occulto nelle feci.

Pazienti a rischio intermedio permette di individuare ..

Sensibilità 92% carcinomi: 69% dei polipi (adenomi precancerosi)
Specificità 87%.
New England Journal of Medicine

Le News di Ansa Salute 14/03/2016 12:24

Tumori: colon, a Chieti centro europeo analisi precoce Innovativo test basato su combinazione Dna e emoglobina fecali



- CHIETI, 14 MAR - L'Unità operativa di Medicina Predittiva del policlinico 'SS. Annunziata' - Università degli Studi Gabriele d'Annunzio di Chieti, sarà il primo centro pubblico europeo a fornire ai cittadini, a partire dal prossimo 4 aprile, il nuovo esame non invasivo per l'individuazione del tumore colon-retto attraverso la tecnologia del DNA fecale, denominato Cologuard, approvato dalla Food and Drug Administration (FDA) americana e introdotto a novembre anche in Italia.

Il centro, che dipende dalla Asl Lanciano-Vasto-Chieti Abruzzo, che ha stabilito con propria Delibera di offrire agli assistiti il test a carico del servizio sanitario regionale, lo utilizzerà per l'analisi precoce di carattere genetico-molecolare per Il tumore del colon-retto,…. ha detto il professore Stefano Martinotti, direttore dell'Unità di Medicina Predittiva del policlinico abruzzese

... Secondo quanto suggeriscono le linee guida italiane SIPMeL,

il test potrebbe essere impiegato per confermare un eventuale esame per la ricerca del sangue occulto nelle feci risultato Positivo, prima di ricorrere alla colonscopia.

Il Policlinico di Chieti, grazie a un accordo siglato con l'americana Exact Sciences che ha sviluppato il test, è il primo ospedale del servizio pubblico in Europa presso il quale siano state installate le

apparecchiature che permettono la preanalisi dei campioni di feci, che vengono successivamente inviati negli Stati Uniti, presso i laboratori dell'azienda, per la lettura del risultato finale.

mt-sDNA Problemi Aperti

Curr. Treat. Options in Oncol. (2022) 23:474–493
DOI 10.1007/s11864-022-00962-4

Lower Gastrointestinal Cancers (AB Benson, Section Editor)

Optimal Strategies for Colorectal Cancer Screening

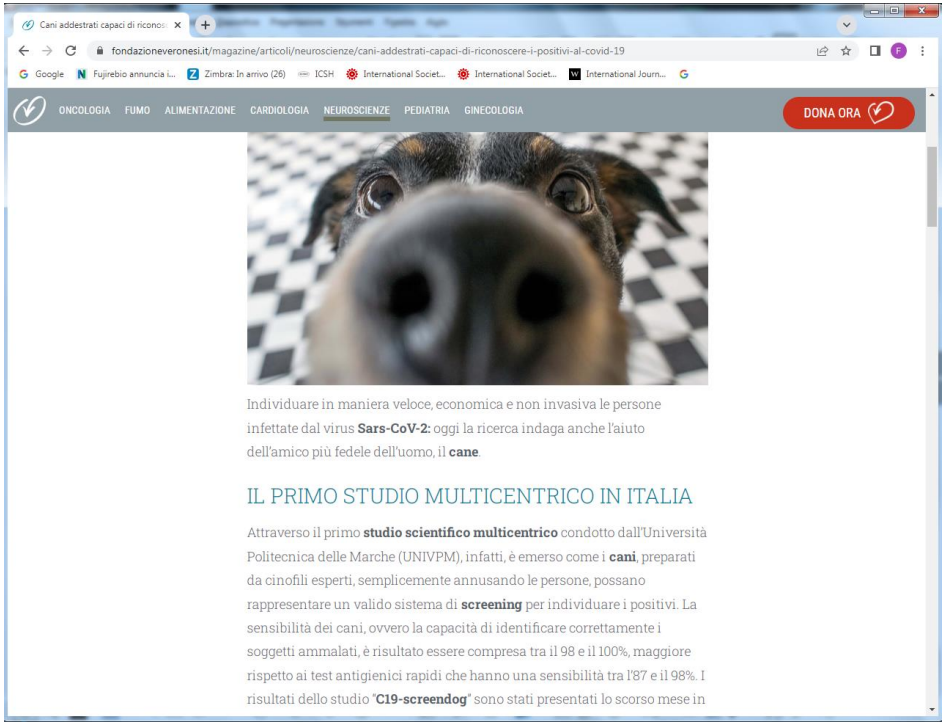
Challenges with mt-sDNA screening

- include cost,
- high false positive rate compared to FIT,
- some uncertainty as to whether further diagnostic work-up is necessary when the result is positive but the follow-up colonoscopy is negative

...

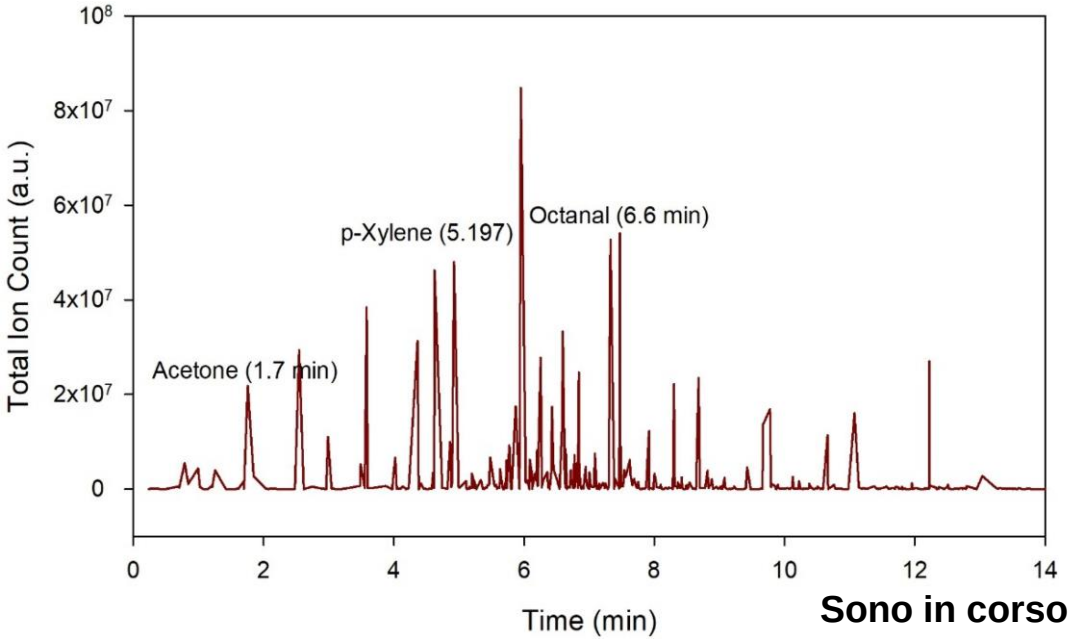
It also has a higher sensitivity for advanced adenomas, large and serrated lesions, multiple lesions, large lesions, and tubulovillous lesions compared to FIT However, **specificity is lower than FIT, which can result in more colonoscopies, more adverse events, and higher costs.**

Composti Organici Volatili (VOC)



- Composti gassosi derivanti dal metabolismo (animale, vegetale)
- Presenti in tutti i compartimenti (respiro / sangue / urine / feci).
- Cambiano in situazioni patologiche (metaboliche, virali, neoplastiche..)

Composti Organici Volatili



- **Lo studio dei COV è cominciato con l'uso della GC-MS**
- **Si sta sviluppando con nuove tecnologie basate su biosensori (identificano classi di composti)**

Sono in corso numerosi studi focalizzati su:

1. **Materiale più idoneo urine / sangue / espirato /feci**
2. **Tipo di analisi più efficiente**
3. **Calibrazione sistemi**
4. **Standardizzazione risposte**

VOC nell'espirato in GC-MC

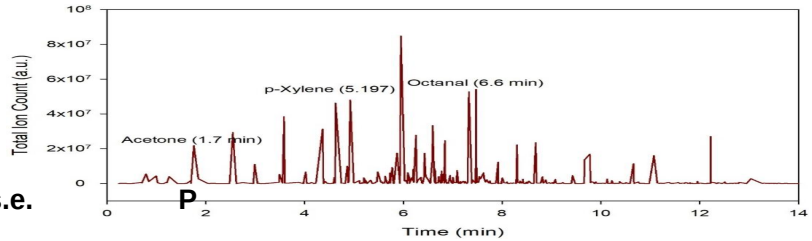


Table 3 Multivariable logistic regression analysis of model A: colorectal cancer versus no cancer diagnosis Cut-off value* Regression coefficient (β) s.e. P BJS Open 2020; 4: 1189–1199

	Cut-off value*	Regr. coeffi. (β)	s.e.	P
Age class (years)	>65 versus≤65	0·7294	0·1959	<0·001
Tetradecane	≤0·39 versus>0·39	0·6398	0·2025	0·002
Ethylbenzene	≤0·35 versus>0·35	0·8162	0·2006	<0·001
Methylbenzene	>1·94 versus≤1·94	0·593	0·1989	0·003
5,9-Undecadien-2-one, 6,10-dimethyl (E)	≤0·41 versus>0·41	0·7661	0·2028	<0·001
Benzaldehyde	≤4·06 versus>4·06	0·6440	0·2114	0·002
Decane	≤0·77 versus>0·77	0·5872	0·2060	0·004
Benzoic acid	>0·94 versus≤0·94	0·5423	0·2332	0·020
1,3-Bis(1-methylethenyl) benzene	>0·52 versus≤0·52	0·6035	0·2541	0·018
Decanal	≤5·99 versus>5·99	−1·7920	0·6677	0·007
Unidentified compound	>0·26 versus≤0·26	1·9308	0·6931	0·005
2-Ethyl-1-hexanol	>2·51 versus≤2·51	−0·9643	0·4826	0·046
Dodecane	>3·51 versus≤3·51	1·6296	0·5247	0·002
Ethanone, 1[4-(1-methylethenyl)phenyl]	≤0·39 versus>0·39	1·3405	0·5494	0·015
Acetic acid	>0·41 versus≤0·41	3·0856	0·9442	0·001

Composti utilizzabili scopo diagnostico sani/CRC

CRC. Analisi VOC espirato

Original article: **Chemical signature of colorectal cancer: case–control study for profiling the breath print**. BJS Open 2020; 4: 1189–1199

Background: Effective screening for colorectal cancer can reduce mortality by early detection of tumours and colonic polyps. An altered pattern of volatile organic compounds (VOCs) in exhaled breath has been proposed as a potential non-invasive diagnostic tool for detection of cancer. The aim of this study was to evaluate the reliability of breath-testing for colorectal cancer screening and early diagnosis using an advanced breath sampler.

Methods: The exhaled breath of patients with colorectal cancer and non-cancer controls with negative findings on colonoscopy was collected using the ReCIVA® Breath Sampler. This portable device is able to capture the alveolar breath fraction without environmental contamination. VOCs were desorbed thermally and analysed by gas chromatography–mass spectrometry. The discriminatory ability of VOCs in detecting colorectal cancer was evaluated by receiver operating characteristic (ROC) curve analysis for each VOC, followed by cross-validation by the leave-one-out method, and by applying stepwise logistic regression analysis.

Results: The study included 83 patients with colorectal cancer and 90 non-cancer controls. **Fourteen VOCs** were found to have significant discriminatory ability in detecting patients with colorectal cancer. The model with the diagnosis of cancer versus no cancer resulted in **a statistically significant likelihood of discrimination of 173·45 (P < 0·001), with an area under the ROC curve of 0·979. Cross-validation of the model resulted in a true predictive value for colorectal cancer of 93 per cent overall. Reliability of the breath analysis was maintained irrespective of cancer stage.**

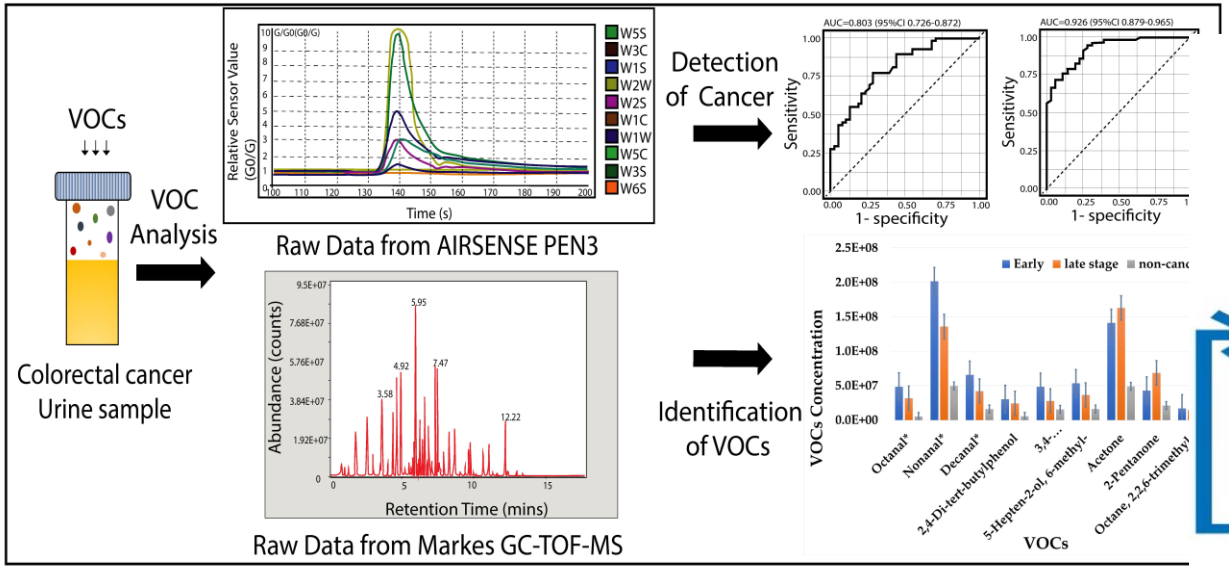
Conclusion: This study demonstrated that analysis **of exhaled VOCs can discriminate patients with colorectal cancer from those without**. This finding may eventually lead to the creation of a smart online sensory device, capable of providing a binary answer (cancer/no cancer) and directing to further screening

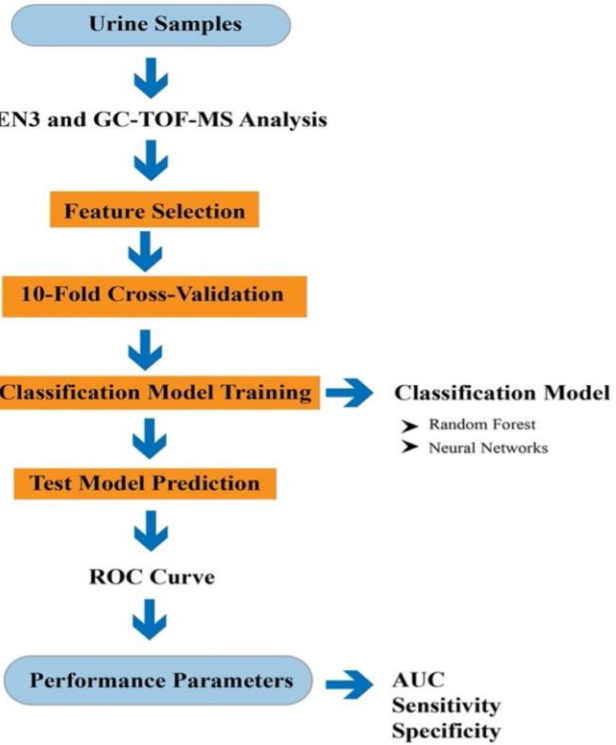
Table 6 Cross-validation of colorectal cancer discrimination (Model A all patients).

	True condition					
	CRC	No cancer	Total	Pred value (%)	Sens (%)	Spec (%)
Cancer	74	6	80	93	90	93
No cancer	8	81	89			
Total	82	87				

CRC. Esiste un impronta nel respiro e può essere utilizzata

GC-MS & Strumenti con Sensori





- **Nati per rilevamenti in loco**
- **Utilizzati rilevamenti ambientali, industria,**
- **Rapidi (analisi pochi minuti)**
- **Economici**
- **Devono essere ‘addestrati’**

Non-Invasive Detection and Staging of Colorectal Cancer Using a Portable Electronic Nose Sensors 2021, 21, 5440

Strumenti Sensori

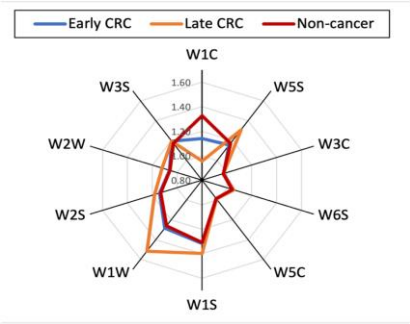
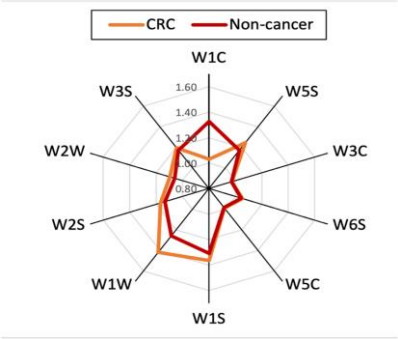


Table 2. Description of the sensors used in PEN3 e-nose provided by Airsense Analytical.

No. Sensors	Substances for Sensing
S1 W1C	Sensitive to aromatic compounds
S2 W5S	Broad range
S3 W3C	Sensitive to aromatic compounds
S4 W6S	Sensitive to hydrogen
S5 W5C	Sensitive to aromatic and aliphatic compounds
S6 W1S	Sensitive to methane in the environment, with broad range
S7 W1W	Sensitive to Sulphur and organic compounds
S8 W2S	Sensitive to alcohol and broad range
S9 W2W	Sensitive to Sulphur compounds
S10 W3S	Sensitive to methane and aliphatic compounds



1. **Costruiscono un ‘impronta digitale’ specifica per patologia**
2. **Vanno elaborati algoritmi specifici per patologia per sistema**
3. **Calibrazione sistemi per esportare informazione**
4. **Armonizzazione risposte tra metodi diversi**

Non-Invasive Detection and Staging of Colorectal Cancer Using a Portable Electronic Nose Sensors 2021, 21, 5440

Sensori fase avanzata di sperimentazione

In uso in GB

In corso a Bari la presentazione di Mistral, lo strumento diagnostico sviluppato dal cluster Inside the Breath "Diagnosi precoce dei tumori? In un soffio!":
è in corso oggi, nell'aula Balab "Guglielmo Minervini" dell'Università di Bari, la presentazione di Mistral, l'innovativo device per la diagnosi di varie patologie, tra cui il tumore del colon-retto e del polmone

Mistral nasce dalla ricerca del cluster tecnologico pugliese Inside the Breath (composto dalle aziende Predict S.r.l., Wel.Co.Me S.r.l. e Reti Meridiane e da Dipartimento di Biologia e Facoltà di Medicina dell'Università degli Studi Aldo Moro di Bari), che ha evidenziato come la presenza di alcuni composti organici volatili (VOCs) nell'espirato sia indice dell'insorgenza di una determinata patologia.

L'incontro di questa mattina, presieduto da Gianluigi De Gennaro (Dipartimento di Biologia, Università degli Studi di Bari) e Donato Altomare (Dipartimento dell'Emergenza e dei Trapianti di organi, Policlinico di Bari), prevede l'intervento di chi ha partecipato attivamente al progetto, e può dunque descrivere le diverse fasi operative.

Dopo i saluti di Antonio Felice Uricchio (rettore Università degli Studi "Aldo Moro" di Bari) e Rocco De Franchi (consigliere per la tutela ambientale, lo sviluppo sostenibile e la decarbonizzazione), l'introduzione di Angelo Gigante (Predict) darà il via ai lavori; alle 10.30, il panel "Breath biopsy per lo screening del cancro colorettale", tenuto da Donato Altomare (Dipartimento dell'Emergenza e dei Trapianti di organi, Policlinico di Bari); alle 11.00, Rosaria Orlandi (Molecular Targeting Unit – I.R.C.S.S. Milano) parlerà di "Sviluppare l'analisi del respiro per una diagnostica oncologica completamente non invasiva"; alle 11.30, il panel "La breath analysis ed il suo possibile ruolo nella diagnostica delle neoplasie del polmone e della pleura" tenuto da Annamaria Catino (Dipartimento di Oncologia Medica – I.R.C.S.S. Bari); alle 12.00, l'intervento di Alessia De Gilio (Dipartimento di Biologia dell'Università degli Studi di Bari); alle 12.30, il panel "Mistral: la diagnosi in un soffio" con Marco Cardanobile (Predict).

Concluderà l'incontro, alle ore 13.00, il Dott. Vito Antonio Delvino (Direttore Generale I.R.C.S.S. Bari).

VOC test triage dopo FIT

Open access Protocol

BMJ Open REducing Colonoscopies in patients without significant bowEl DiseasE: the RECEDE Study - protocol for a prospective diagnostic accuracy study

ABSTRACT

Introduction Demand for colonoscopies and CT colonography (CTC) is exceeding capacity in National Health Service Trusts. In many patients colonoscopies and CTCs show no significant bowel disease (SBD). Faecal Immunochemical Testing (FIT) is being introduced to prioritise patients for colonoscopies but is insufficient to identify non-SBD patients meaning colonoscopy and CTC demand remains high. The REducing Colonoscopies in patients without significant bowEl DiseasE (RECEDE) study aims to test urine volatile organic compound (VOC) analysis alongside FIT to improve detection of SBD and to reduce the number of colonoscopies and CTCs.

Risk stratification of symptomatic patients suspected of colorectal cancer using faecal and urinary markers tract

Aim: Faecal markers, such as the faecal immunochemical test for haemoglobin (FIT) and faecal calprotectin (FCP), have been increasingly used to exclude colorectal cancer (CRC) and colonic inflammation. However, in those with lower gastrointestinal symptoms there are considerable numbers who have cancer but have a negative FIT test (i.e. false negative), which has impeded its use in clinical practice. We undertook a study of diagnostic accuracy CRC using FIT, FCP and urinary volatile organic compounds (VOCs) in patients with lower gastrointestinal symptoms.
Method: One thousand and sixteen symptomatic patients with suspected CRC referred by family physicians were recruited prospectively in accordance with national referring protocol. A total of 562 patients who completed colonic investigations, in addition to providing stool for FIT and FCP as well as urine samples for urinary VOC measurements, were included in the final outcome measures.
Results: The sensitivity and specificity for CRC using FIT was 0.80 [95% confidence interval (CI) 0.66-0.93] and 0.93 (CI 0.91-0.95), respectively. For urinary VOCs, the sensitivity and specificity for CRC was 0.63 (CI 0.46-0.79) and 0.63 (CI 0.59-0.67), respectively.
However, for those who were FIT-negative CRC (i.e. false negatives), the addition of urinary VOCs resulted in a sensitivity of 0.97 (CI 0.90-1.0) and specificity of 0.72 (CI 0.68-0.76).
Conclusions: When applied to the FIT-negative group, urinary VOCs improve CRC detection (sensitivity rises from 0.80 to 0.97), thus showing promise as a second-stage test to complement FIT in the detection of CRC.
Clinical Trial Colorectal Dis (2018 Dec;20(12):O335-O342)

In uso in GB

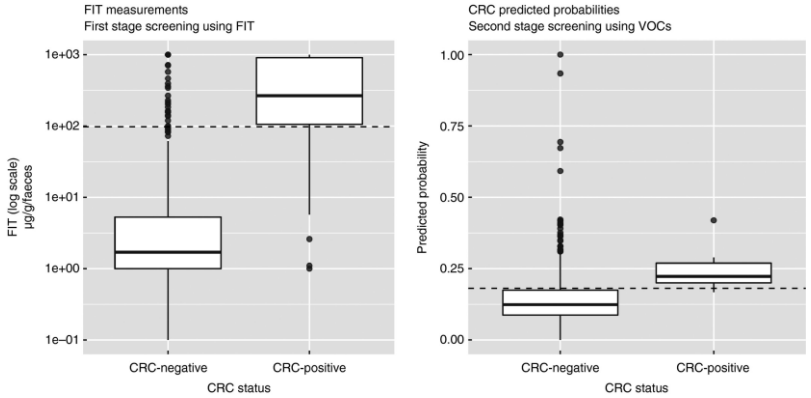
second-stage per implementare FIT nel rilevamento dei CRC.
sensibilità dal 0.80 (FIT-Hb) a 0.97 FIT-Hb+VOC

Mt-fDNA & VOC test triage dopo FIT

Table 4. Diagnostic performance of biomarker combination for CRC and high-risk/advanced adenoma.
Biomedicines 2022, 10, 255

Disease Group	Biomarker(s)	Sens (%)	Spec (%	PPV (%)	NPV (%)	Ref.
CRC (n = 65)	FIT (20 µg);	73.8				
Cologuard®		92.3	94.9			N. Engl. J. Med. 2014
HRA (n = 757)	FIT (20 µg);	42.2	86.6			
Cologuard®		23.8				
CRC (n = 35)	FIT (3 µg);	80	93	44	99	Colorectal Dis. 2018
VOCs	(FIT –)	97	72		100	

Triage sui test negativi



Sensibilità FIT

Bowel cancer screening

OPEN ACCESS

Original research

Faecal immunochemical test is superior to symptoms in predicting pathology in patients with suspected colorectal cancer symptoms referred on a 2WW pathway: a diagnostic accuracy study

Nigel D'Souza ,[1,2,3] Theo Georgiou Delisle,[1,3] Michelle Chen,[4] Sally Benton,[5] Muti Abulafi ,[1] The NICE FIT Steering Group

► Additional material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/gutjnl-2020-321956).

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ABSTRACT

Objective To assess whether a faecal immunochemical test (FIT) could be used to select patients with suspected colorectal cancer (CRC) symptoms for urgent investigation.

Design Multicentre, double-blinded diagnostic accuracy study in 50 National Health Service (NHS) hospitals across England between October 2017 and December 2019. Patients referred to secondary care with suspected CRC symptoms meeting NHS England criteria for urgent 2 weeks wait referral and triaged to investigation with colonoscopy were invited to perform a quantitative FIT. The sensitivity of FIT for CRC, and effect of relevant variables on its diagnostic accuracy was assessed.

Results 9822 patients were included in the final analysis. The prevalence of CRC at colonoscopy was 3.3%. The FIT positivity decreased from 37.2% to 19.0% and 7.6%, respectively, at cut-offs of 2, 10 and 150 µg haemoglobin/g faeces (µg/g). The positive predictive values of FIT for CRC at these cut-offs were 8.7% (95% CI, 7.8% to 9.7%), 16.1% (95% CI 14.4% to 17.8%) and 31.1% (95% CI 27.8% to 34.6%), respectively, and the negative predictive values were 99.8% (95% CI 99.7% to 99.9%), 99.6% (95% CI 99.5% to 99.7%) and 98.9% (95% CI 98.7% to 99.1%), respectively. The sensitivity of FIT for CRC decreased at the same cut-offs from 97.0% (95% CI 94.5% to 98.5%) to 90.9% (95% CI 87.2% to 93.8%) and 70.8% (95% CI 65.6% to 75.7%), respectively, while the specificity increased from 64.9% (95% CI 63.9% to 65.8%) to 83.5% (95% CI 82.8% to 84.3%) and 94.6% (95% CI 94.1% to 95.0%), respectively. The area under the receiver operating characteristic curve was 0.93 (95% CI 0.92 to 0.95).

Conclusion FIT sensitivity is maximised to 97.0% at the lowest cut-off (2 µg/g); a negative FIT result at this cut-off can effectively rule out CRC and a positive FIT result is better than symptoms to select patients for urgent investigations.

Trial registration number ISRCTN49676259.

Significance of this study

What is already known on this subject?

- Faecal immunochemical tests (FIT) are already recommended by the National Institute for Heath and Care Excellence to guide referral of patients with low-risk bowel symptoms but has not been recommended for all symptomatic patients due to concerns over the quality and power of previous studies.

What are the new findings?

- FIT sensitivity for colorectal cancer (CRC) is maximised to 97.0% at the limit of detection of 2 µg haemoglobin (Hb)/g faeces (µg/g).
- A faecal Hb concentration (f-Hb) result less than the limit of detection in symptomatic patients indicates that their chances of not having CRC is 99.8%.
- There was no significant variation in the ability of FIT to detect CRC by patient or tumour characteristics, including age, sex, ethnicity, deprivation or iron-deficiency anaemia.

How might it impact on clinical practice in the foreseeable future?

- FIT could be used to rule out CRC in primary care for symptomatic patients meeting 2 weeks wait criteria, with sensitivity equivalent to colonoscopy at a cut-off of 2 µg/g.
- FIT can be used to prioritise patients for investigation, as CRC and other serious bowel disease is more likely at higher f-Hb concentrations.
- The diagnostic accuracy of FIT for CRC is superior to symptoms.

INTRODUCTION

Bowel symptoms are the imprecise basis of referral for urgent investigation in England to rule out cancer.[1–4] Symptoms are non-specific for colorectal cancer (CRC): 96 of 100 patients referred urgently on a 2-week (2WW) wait pathway under National Institute for Health and Care Excellence (NICE) NG12 guidelines will not have CRC.[4] Urgent referrals have increased by 90% over the last 5 years[2]; 45% of UK endoscopy units are failing to meet CRC waiting targets.[3]

The faecal immunochemical test (FIT) was recommended by NICE (DG30)[4] in 2017 to guide the referral of patients with low-risk symptoms of

Table 4 Diagnostic accuracy of FIT for CRC and SBD at different cut-offs

Risk category	FIT positivity	Cut-off (µg/g)	Sensitivity	Specificity	PPV	NPV
≥2	37.2	CRC	97.0 (94.5 to 98.5)	64.9 (63.9 to 65.8)	8.7 (7.8 to 9.7)	99.8 (99.7 to 99.9)
		HRA	65.8 (61.0 to 70.3)	64.1 (63.1 to 65.0)	7.6 (6.7 to 8.5)	97.7 (97.3 to 98.0)
		IBD	73.1 (68.6 to 77.2)	64.4 (63.4 to 65.4)	8.5 (7.7 to 9.5)	98.1 (97.8 to 98.5)
		SBD	77.1 (74.6 to 79.5)	68.2 (67.2 to 69.2)	24.8 (23.4 to 26.3)	95.6 (95.1 to 96.1)
≥10	19.0	CRC	90.9 (87.2 to 93.8)	83.5 (82.8 to 84.3)	16.1 (14.4 to 17.8)	99.6 (99.5 to 99.7)
		HRA	45.4 (40.5 to 50.3)	82.2 (81.4 to 83.0)	10.3 (8.9 to 11.7)	97.1 (96.7 to 97.5)
		IBD	57.8 (53.0 to 62.6)	82.8 (82.0 to 83.6)	13.3 (11.8 to 14.9)	97.7 (97.4 to 98.1)
		SBD	62.6 (59.8 to 65.4)	87.0 (86.3 to 87.7)	39.6 (37.4 to 41.8)	94.5 (93.9 to 95.0)
≥150	7.6	CRC	70.8 (65.6 to 75.7)	94.6 (94.1 to 95.0)	31.1 (27.8 to 34.6)	98.9 (98.7 to 99.1)
		HRA	22.1 (18.2 to 26.4)	93.0 (92.5 to 93.5)	12.4 (10.1 to 15.0)	96.4 (96.0 to 96.8)
		IBD	36.8 (32.2 to 41.5)	93.7 (93.2 to 94.2)	21.0 (18.1 to 24.1)	97.0 (96.7 to 97.4)
		SBD	41.0 (38.2 to 43.9)	96.9 (96.5 to 97.3)	64.5 (60.9 to 67.9)	92.4 (91.8 to 92.9)

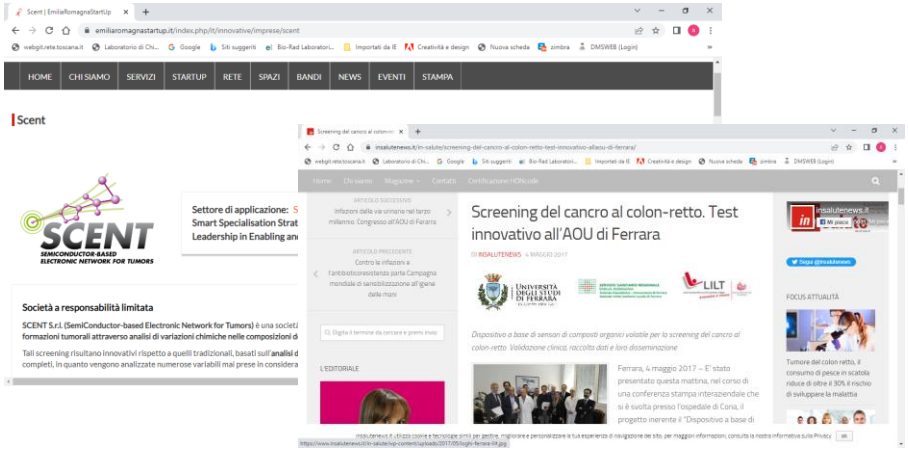
Sintomatici Le performance del FIT restano molto interessanti. … la presenza di sangue nei è un ottimo indicatore di lesione

Altre esperienze.. Emilia Romagna

Meldola, 16 luglio 2018 – **L'Istituto Scientifico Romagnolo per lo Studio e la cura dei Tumori (IRST) IRCCS di Meldola (FC),** …, e Diatech Pharmacogenetics, ….n innovativo kit, denominato **"EasyPGX® ready FL-DNA",** per l'identificazione di lesioni prenoplastiche e neoplastiche del colon retto (CRC).

---tipologia dell'alterazione del DNA e informazioni quali-quantitative sui livelli di rischio evolutivo sia di lesioni precancerose sia della stessa storia naturale del tumore individuato. Inoltre, il test può anche essere utilizzato nel monitoraggio dei soggetti già operati per tumore del colon che, come noto, sono esposti al rischio di successive recidive loco-regionali. Queste sono le applicazioni cliniche più interessanti, **le quali richiedono però che il materiale fecale sia raccolto e conservato nelle migliori condizioni.**

Ferrara, 4 maggio 2017 – E' stato presentato questa mattina, nel corso di una conferenza stampa interaziendale che si è svolta presso l'ospedale di Cona, il progetto inerente il **"Dispositivo a base di sensori di composti organici volatili per lo screening del cancro al colon-retto: validazione clinica, raccolta dati e loro disseminazione".**



..nessuno dei 2 metodi è ancora in grado si sostituire il FIT

Costi test mt-sDNA

Test di Cologuard: come funziona, contro colonscopia, costi e altro
Dicembre 21, 2020

Quanto costa?
Cologuard è coperto da molte compagnie di assicurazione sanitaria, incluso Medicare. Se sei idoneo (di età compresa tra 50 e 75 anni) per lo screening del cancro al colon, potresti essere in grado di ottenere Cologuard senza spese vive.

Se non hai un'assicurazione o se la tua assicurazione non la copre**, il costo massimo di Cologuard è $ 649.**

EasyPGX® ready FL-DNA
Costo … non trovato
Materiale da conservare -20°C fino consegna

Nomenclatore regionale (Toscana) :
COLONSCOPIA IN SEDAZIONE COSCIENTE 155 Euro

VOC screening

Requisiti che li rendono particolarmente interessanti

- Semplici (nati per rilevamenti in loco)
- Versatili (rilevamenti ambiente, industria, medicina)
- Rapidi (analisi pochi minuti)
- Economici

Prima dell'utilizzo

1. Calibrazione sistemi
2. Standardizzazione risposte

Non possono essere tarati ed addestrati ad ogni utilizzo