CURRICULUM VITAE

SUMMARY

1. B.Sc. Pharmacy, Ph.D. Pharmacology, Post-doctoral research in Genetics, Cancer genetics and molecular pharmacology
2. Consultant Clinical Scientist, Honorary Reader, King's College London (KCL).
3. Head of the Department of Pharmacy, Ibn Hayyan University College, Iraq.
4. Teaching pharmacology, pharmaco-genetics, cancer pathology and genetics in KCL, BCNO, and Manchester University, UK.
5. Teaching pharmacology, genetics and biotechnology to undergraduates in the pharmacy department in Ibn Hayyan university, Iraq. And gene therapy, cancer genetics and gene cloning to postgraduate students in Baghdad university and mustansiriyah university, Iraq.
6. Over 30 years of experience in Genetics, molecular pharmacology, cancer genetics and molecular pathology investigation and cancer diagnostics.
7. Have lead a number of molecular oncology departments/units in various universities and teaching hospitals in the UK.
8. Development of large number of molecular diagnostics assays for haematological and solid cancers. These included large number of in situ hybridisation and IHC assays.
9. Experience in NGS technology and design. This included the design of MPN NGS panel assay, the performance of NGS analyses on solid cancer tissues, and the design of a new technique for global mutation detection.
10. Strong experience in primary and cell lines cultures and manipulations. This included work on transdifferentiation and DNAzymes.
11. Regular consultant to pharmaceutical and diagnostics companies on molecular pharmacology/pathology strategies.
12. Member European Leukaemia Network.
13. Member of NICE cancer molecular diagnostics evaluation group, UK.
14. Collaborative work with a number of national and international haematologists, oncologists and cancer researchers.
15. Collaborative work with a number of pharmaceutical companies.
16. Collaboration with a number of national and international diagnostics companies.
17. Over 40 publications in prestigious journals.
18. Over 100 presentations in national and international meetings on cancer molecular diagnostics.
19. Reviewer for a number of international journals.
20. Supervision of a number of Ph.D. and M.D. studies in UK universities.
21. Joint supervision of 14 Iraqi Ph.D. and M.Sc. students from various Iraqi universities at Guy's Hospital and KCL.
22. Successful grant applications.

A. Personal, Qualification and Employment Personal record

Full name: Khalid Tobal
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Qualification

B. Sc. Pharmacy	Baghdad University	1977
Ph.D. Pharmacology	University of Nottingham	1983

Present employment January 2017-
Lead Clinical Scientist, Department of Sheffield Diagnostics Genetics Service, Sheffi eld Children Hospital, Sheffield, UK.
Leading 3 sections (Hereditary Cancers, Leukaemia MRD monitoring, and Phamaco-genetics). Parts of my responsibilities include the development of new sensitive NGS panel assays for tumour tissues and cftDNA, ddPCR assays, representing the genetics centre in the 100K Genome project, and supervision of research projects.

Most recent employment Sept. 2015- Aug. 2016
Head of the Department of Pharmacy, Ibn Hayyan University College, Iraq
Lecturing Pharmacology in the department in addition to heading the department. I did not renew my contract and decided to return to the UK.

March 2008- February 2015
Consultant Clinical Scientist, Honorary Reader (KCL).
Head of the Molecular Oncology Department, Guy's and St. Thomas' NHS Foundatio n Trust.

Main responsibilities:
- Initiating and directing research into the molecular biology of cancers, the identification of new diagnostic, prognostic and MRD markers, and the development of new protocols for the diagnosis and monitoring of patients with these diseases.
- The provision of molecular oncology/molecular pathology diagnostic service for patients with haematological and solid malignancies.
- Management of the personnel and financial resources of the molecular oncology unit.

Our Research and development work includes:
A. Developing molecular techniques for the diagnosis and monitoring of patients with different types of leukaemia.

B. Development of new diagnostics assays for genetic mutations in solid cancer, which influence patients' management.
C. Investigation of gene expression changes related to relapse, with the aim of isolating genetic markers to identify patients at high risk of relapse. This included in situ hybridisation and IHC work.
D. Investigation of micro RNA levels and sequence abnormalities in haematological malignancies (presently in CML and MPD).
E. Molecular profiling investigation in solid cancers.
F. NGS development and investigations in cancer.

Ph.D. projects supervised

Below are some of the Ph.D. projects I supervised.

1. Genetic abnormalities in medullablastoma and ependymoma.
2. Genetic analysis of breast cancer
3. Investigation of genetic abnormalities in colorectal cancer
4. Genetic mutations associated with hyper and hypo thyroidism
5. Genetic abnormalities in ovarian cancer
6. Investigation of genetic changes caused by nanoparticles
7. Development and analysis of a peripheral blood based molecular diagnostic system for breast cancer.
8. Molecular investigation of embryonic diabetes.

Oct. 2004- March 2008

Consultant Clinical Scientist/ Head of the MRD Unit. Department of Haematological Medicine, King's College Hospital, London.

Previous employment and appointments held

Jan. 1993- Oct. 2004	Head of the Molecular Oncology Group (1993-2001: Principal Clinical Scientist/Honorary Lecturer, 2001-Oct. 2004: Consultant Clinical Scientist/ Honorary Lecturer) University Department of Haematology/ Manchester Royal Infirmary.
Sept. 1990- Jan. 1993	Research Fellow/ Honorary Lecturer, Department of Clinical Sciences, Institute of Ophthalmology, London.
Sept. 1987- Aug. 1990	Molecular Oncology Group Leader, responsible for research into the molecular biology of eye tumours, including uveal melanoma and orbital lymphoma.
Sept. 1987- Aug. 1991	Senior Biochemist (Molecular Biologist), Haematology department, King's College Hospital London.
Oct. 1985- Sept. 1987	Lecturer/ Pharmacology (part-time), British College of Naturopathy and Osteopathy, London.
Nov. 1984- Sept. 1985	Post-Doctoral Research Assistant, University of Nottingham, Nottingham.
May 1983- Oct. 1983	Senior Research Associate, School of Biological Sciences, University of East Anglia, Norwich.
	Contract research on the side effects of a new drug with Fisons Pharmaceuticals.

B. TEACHING AND SUPERVISION

1. Previous teaching duties:

A. Ph.D. students supervision (4 students, Completed their studies and were awarded PhD.)
B. Supervision of joint Ph.D. and M.Sc. students from Iraqi universities (14 students successfully completed)
C. M.D. student supervision (5, All completed their studies and awarded MD.s)
D. Undergraduate medical students SSM course.
E. Undergraduate research placement and sandwich projects.
F. Pharmacology and cancer genetics Lecturer

2. Examination responsibilities

A. Medical Undergraduate SSM courses.
B. Medical Undergraduate Research projects.
C. Research placement students.
D. Final year students Pharmacology examination.

3. Statement on teaching

Since 1987, I have taught pharmacology, Genetics and cancer genetics in the UK, and have also taught and supervised students and medical and scientific staff.
This included the planning and supervision of Ph.D., M.D. and sandwich B.Sc. projec ts in a number of institutes; King's College London, Institute of Ophthalmology/Lond on, and Manchester University and MRI/Manchester.
In recent years I have co-supervised 14 Ph.D. and M.Sc. students with various Iraqi u niversities at Guy's Hospital and KCL.
In 2015 I was appointed the head of the department of Pharnacy in Ibn Hayyan Univer sity, Iraq. I taught pharmacology and pharmaceutical biotechnology to pharmacy unde rgraduate students, and akso taught cancer genetics, molecular biology and gene tgera py to postgraduate students in two other universities (Baghdad University and Mustab siriyah University).

My teaching method:

I involve my students in the subject of the lecture. My aim in teaching is to provide m y students with the latest information in the field relevant to their study to enable them to practice with good level of expertise and to progress in their chosen career. I there fore do not restrict my aim to the students passing the eventual exam on the subject, My philosophy of teaching is to create an environment that allows for supervised expl oration and learning. I believe that the most significant learning occurs in situations th at are both meaningful and realistic.
In teaching pharmacology, I believe its best for the students to understand the full pict ure of the disease and how does any treatment fits in, rather than simply memorising d rugs actions, side effects and interactions. I involve my students in understanding the physiology of the disease and factors participating in its biology and onset, before loo king at strategies to counter those factors and where different drugs fit in. In bringing case study senarios, we can discuss the best options available, taking into account the possible interactions with other treatnents and health parameters for the patient concer ned.
In teaching molecular biotechnology, my teaching method is to make the students ima gine they are in a laboratory planning to perform the necessary techniques to achieve t

he given aim of the work.

C. RESEARCH AND ACADEMIC/PROFESSIONAL STANDINGS

1. Publications

(1) Academic Journal Papers

A. Transdifferentiation

1. **Tobal K**, Ellis DK, de Pomerai DI (1988) Cellular src gene expression associated with lentoidogenesis in transdifferentiated cultures. *Dev. Growth & Differ*. 30(5), 589-602.

A. Solid cancers

2. **Tobal K**, Warren W, Cooper CS, McCartney A, Hungerford J, Lightman S (1992) Increased expression and mutation of p53 in choroidal melanoma. *Br. J. cancer,* 66(5), 900-904.
3. **Tobal K**, Deuble K, McCartney A, Lightman S (1993) Characterization of cellular infiltration in choroidal melanoma. *Melanoma Res.*, 3(1), 63-65.
4. **Tobal K**, Sherman LS, Foss AJ, Lightman SL (1993) Detection of melanocytes from uveal melanoma in peripheral blood using the polymerase chain reaction. *Invest. Opthalmol. Vis. sci.,* 34(9), 262-265.
5. Hykin PG, **Tobal K**, McIntyre G, Matheson MM, Towler HM, Lightman SL (1994) The diagnosis of delayed post-operative endopthalmitis by polymerase chain reaction of bacterial DNA in vitreous samples. *J. Med. Microbiol.*, 40(6), 408-415.
6. Sakellariou S, Morgan Y, Heaton N, Portmann B, Quaglia A, **Tobal K**. New monoallelic (partial tandem duplication) mutation of HNF1a gene in steatotic hepatocellular adenoma. *Eur J Gastroenterol Hepatol.* 2011 Jul;23(7):623-7.
7. Santis G, Angell R, Nickless G, Quinn A, Herbert A, Cane P, Spicer J, Breen R, McLean E, **Tobal K**. Screening for EGFR and KRAS mutations in endobronchial ultrasound derived transbronchial needle aspirates in non-small cell lung cancer using COLD-PCR. *PLoS One.* 2011;6(9):e25191.
8. Sakellariou S, Al-Hussaini H, Scalori A, Samyn M, Heaton N, Portmann B, **Tobal K**, Quaglia A. Hepatocellular adenoma in glycogen storage disorder type I: a clinicopathological and molecular study. *Histopathology* 2012 May;60.
9. Pennycuick A, Simpson T, Crawley D, Lal R, Santis G, Cane P, **Tobal K**, Spicer J. Routine EGFR and KRAS Mutation analysis using COLD-PCR in non-small cell lung cancer. *Int J Clin Pract.* 2012 Aug;66(8):748-752.
10. Michalarea V, Calcasola M, Cane P, **Tobal K**, Izatt L, Spicer J. EGFR-mutated lung cancer in Li-Fraumeni syndrome. *Lung Cancer.* 2014 Sep;85(3):485-7.
11. Gao F, Pfeifer E, Farah H, Karampini E, Dua D, Kamal N, Cane P, **Tobal** K, Sethi T, Spicer J, McCaughan F. Microdroplet digital PCR: detection and quantitation of biomarkers in archived tissue and serial plasma samples in patients with lung cancer. J. Thorac Oncol. 2015, 10, 212-7.

C. Haematolosical malignancies

12. **Tobal K**, Layton DM, Mufti GJ (1989) Non-invasive isolation of constitutional DNA for genetic analysis. *Lancet,* 2(8674), 1281-1282.
13. **Tobal K**, Pagliuca A, Bhatt B, Bailey N, Layton DM, Mufti GJ (1990) Mutation of the human FMS gene (M-CSF receptor) in myelodysplastic syndromes and acute

myeloid leukemia. *Leukemia,* 4(7), 486-489.
14. Mangi MH, Layton DM, **Tobal K**, Mufti GJ (1991) Croos-lineage rearrangement of antigen receptor gene in atypical chronic myeloid leukemia. *Leukemia,* 5(3), 210-213.
15. Saunders MJ, **Tobal K**, Liu Yin JA (1994) Detection of t(8;21) by reverse transcriptase polymerase chain reaction in patients in remission of acute myeloid leukaemia type M2 after chemotherapy or bone marrow transplantation. *Leuk. Res.,* 18(12), 891-895.
16. **Tobal K**, Saunders MJ, Grey MR, Liu Yin JA (1995) Persistence of RAR alpha-PML fusion mRNA detected by reverse transcriptase polymerase chain reaction in patients in long-term remission of acute promyelocytic leukaemia. *Br. J. hae matol.* 90(3), 615-618.
17. **Tobal K**, Johnson PR, Saunders MJ, Harrison CJ, Liu Yin JA (1995) Detection of CBFB/MYH11 transcripts in patients with inversion and other abnormalities of chromosome 16 at presentation and remission. *Br. J. Haematol.,* 91(1), 104-108.
18. MJ Saunders, **K Tobal**, S Keeney, JA Liu Yin (1996) Expression of diverse AML1-MTG8 transcripts is a consistent feature in acute myeloid leukaemic with t(8;21) irrespective of disease phase. *Leukemia,* 10(7), 1139-42.
19. **Tobal K**, Liu Yin JA (1996) Monitoring of minimal residual disease by quantitative reverse transcriptase-polymerase chain reaction for AML1-MTG8 transcripts in AML-M2 with t(8;21). *Blood,* 88, 3704-3709.
20. Evans PAS, Short MA, Jack AS, Norfolk DR, Child CR, Davies F, **Tobal K** et al (1997) Detection and quantitation of the CBFB-MYH11 transcripts associated with the inv(16) in presentation and follow up samples from patients with AML. *Leukaemia.* 11(3), 364-369.
21. Saunders MJ, Brereton ML, Adams JA, **Tobal K**, Liu Yin JA. (1997) Expression of AML1-MTG8 transcripts in clonogenic cells grown from bone marrow of patients in remission of acute myeloid leukaemia with t(8;21). *Br. J. Haematol.* 99(4), 921-924.
22. **Tobal K,** Liu Yin JA. (1998)
Appropriate controls for RT-PCR. In: Debate round-table: appropriate controls f or RT-PCR, (Eds.) Lion TD, Kidd V. *Leukemia,* 12, 1983-1993.
23. **Tobal K**, Liu Yin JA (1998) RT-PCR method with increased sensitivity shows persistence of PML-RARA fusion transcripts in patients in long-term remission of APL. *Leukemia,* 12(9), 1349-1354.
24. **Tobal K**, Liu Yin JA (1998) Molecular monitoring of minimal residual disease in acute myeloblastic leukaemia with t(8;21) by RT-PCR. *Leuk-Lymphoma,* 31(1-2), 115-120.
25. **Tobal K**, Liu Yin JA (1998) Application of molecular techniques in leukaemia. *CME Bulletin/Haematology,* 1(3), 91-93.
26. Liu Yin JA, **Tobal K** (1999) Detection of minimal residual disease in acute myeloid leukaemia: methodologies, clinical and biological significance. *Br. J. Haematol.* 106 (3), 578-590.
27. **Tobal K**, Newton J, Macheta M. et al. (2000) Molecular quantitation of minimal residual disease in acute myeloid leukaemia with t(8;21) can identify patients in durable remission and predict clinical relapse. *Blood, 95,* 815-819.
28. **Tobal K** (2000) Quantitation of PML-RAR transcripts in APL patients. *Leukemia,* 14(8), 1530-1531.
29. **Tobal K**, Moore H, Macheta M, Liu Yin JA (2001) Monitoring minimal residual disease and predicting relapse in APL by quantitating PML-RARA transcripts with a sensitive competitive RT-PCR method. *Leukemia* 2001,15(7),1060-5.
30. MH. Sheikhha, **K. Tobal**, JA. Liu Yin. High level of microsatellite instability but

not hypermethylation of MMR genes in therapy-related and secondary acute myeloid leukaemia and myelodysplastic syndrome. *Br. J. Haematol.* 2002, 117(2), 359-65.

31. MH. Sheikhha, A. Awan, **K. Tobal**, JA. Liu Yin. Prognostic significance of FLT3 ITD and D835 mutations in AML patients. *Hematol J.* 2003, 4(1), 41-6.
32. Garg, H. Moore, **K. Tobal**, JA. Liu Yin. Prognostic significance of quantitative analysis of WT1 gene transcripts by competitive reverse transcription polymerase chain reaction in acute leukaemia. *Br J Haematol.* 2003, 123(1), 49-59.
33. M. Kabuli, J.A. Liu Yin, **K. Tobal.** Targeting PML/RAR transcript with DNAzymes results in reduction of proliferation and induction of apoptosis in APL 4040cells. *the Hematol J.* 2004;5(5):426-33.
34. Tobal K, Frost L, Liu Yin JA. Quantification of DEK-CAN fusion transcript by real-time reverse transcription polymerase reaction in patients with t(6;9) acute myeloid leukemia. Haematologica. 2004 Oct;89(10):1267-9.
35. David Osborne, Lindsay Frost, **Khalid Tobal**, John A Liu Yin. Elevated levels of wt1 transcripts in bone marrow harvests are associated with a high relapse risk in patients autografted for acute myeloid leukemia. *Bone Marrow Transplant.* 2005 Jul;36(1):67-70.
36. Guinn BA, Bland EA, Lodi U, Liggins AP, **Tobal K**, Petters S, Wells JW, Banham AH, Mufti GJ. Humoral detection of leukaemia-associated antigens in presentation acute myeloid leukaemia. *Biochem Biophys Res Commun.* 2005 Oct 7;335(4):1293-304.
37. **Tobal K**. Prognostic value of minimal residual disease monitoring in acute myeloid leukemia patients with t(9;11)(p22;q23). *Haematologica.* 2005;90(12):1586A.
38. **Tobal K**, Liu Yin JA. Diagnosis and monitoring of AML1-MTG8 (ETO)- positive acute myeloid leukemia by qualitative and real-time quantitative RT- PCR. *Methods Mol Med.* 2006;125:149-61.
39. Guinn BA, **Tobal K**, Mills KI. Comparison of the survival implications of tumour-associated versus cancer-testis antigen expression in acute myeloid leukaemia. *Br J Haematol.* 2007;136(3):510-2.
40. Barbara-ann Guinn and **Khalid Tobal**. Tumor Antigens as Markers of Minimal Residual Disease in Acute Myeloid Leukemia. In: *Tumor Markers Research Perspectives, Chapter 6, Nova Publishers.*
41. Lim ZY, Pearce L, Ho AY, Barber L, Ingram W, Usai M, **Tobal K**, Devereux S, Pagliuca A, Mufti GJ. Delayed attainment of full donor chimaerism following alemtuzumab-based reduced-intensity conditioning haematopoeitic stem cell transplantation for acute myeloid leukaemia and myelodysplastic syndromes is associated with improved outcomes. *Br J Haematol.* 2007 Aug;138(4):517-26.
42. Mijovic A, Abdallah A, Pearce L, **Tobal K**, Mufti GJ. Effects on erythropoiesis of alemtuzumab-containing reduced intensity and standard conditioning regimens.Br *J Haematol.* 2008; 142 (3): 444-452.
43. 0stergaard M, Nyvold CG, Jovanovic JV, Andersen MT, Kairisto V, Morgan YG, **Tobal K**, Pallisgaard N, Ozbek U, Pfeifer H, Schnittger S, Grubach L, Larsen JK, Grimwade D, Hokland P. Development of standardized approaches to reporting of minimal residual disease data using a reporting software package designed within the European LeukemiaNet. *Leukemia* 2011 Jul;25(7):1168-73.
44. Jovanovic JV, Ivey A, Vannucchi AM, Lippert E, Oppliger Leibundgut E, Cassinat B, Pallisgaard N, Maroc N, Hermouet S, Nickless G, Guglielmelli P, van der Reijden BA, Jansen JH, Alpermann T, Schnittger S, Bench A, **Tobal K**, et al. Establishing optimal quantitative-polymerase chain reaction assays for routine diagnosis and tracking of minimal residual disease in JAK2-V617F-associated myeloproliferative neoplasms: a joint European LeukemiaNet/MPN&MPNr-

EuroNet (COST action BM0902) study. *Leukemia.* 2013 Oct;27(10):2032-9.

45. Mahood WS, Nadir MI, **Tobal K**, Asker BA. Detection of kras mutation in circula ting free DNA (cfDNA). International Journal of Current Medical Sciences 2013; 3(2):15-19.
46. Alyaqubi KJ, Al-Faisal AHM, Al-Mudahafar AMJ, **Tobal K**. Assessment of m ultidrug resistance gene (MDR1) expression in Iraqi acute myeloid leukemic patie nts. *International Journal of Advanced Research* 2014;2(6):375-383.
47. Ommen HB, Touzart A, MacIntyre E, Kern W, Haferlach T, Haferlach C, **Tobal K**, Hokland P, Schnittger S. The Kinetics of relapse in DEK-NUP214-positive ac ute myeloid leukemia patients. Eur J Hematol, 2015, 95, 436-41.

Molecular Biology papers

1. Merdaw MA, **Tobal K**, Al-Bashier NT, Al-Taie LH, Hussam-aldeen T, Jasim EA, Al-Zuhairy AA. Isolation and genotyping of *trichomonas vaginalis* isolates by PCR-RAPD in Baghdad city. *International Journal of Science and Nature* 2014;5(4):689-693.

(2) Conference contributions/refereed

1. **Tobal K**, Layton DM, Mufti GJ (1989)
   Rearrangement of c-myc oncogene in Primary Myelodysplastic Syndromes (P-MDS). *Br. J. Haematol.,* 71, p39.
2. Mangi M, Alhaq A, **Tobal K**, Layton DM, Mufti GJ (1989)
   Arrangement of Immunoglubulin (Ig) and T-cell receptor (TCR) genes in Prima ry Myelodysplastic Syndromes (P-MDS). *Br. J. Haematol.,* 71, p38.
3. Hykin P, **Tobal K**, Towler H, Lightman S (1992)
   Diagnosis of post-operative endophthalmitis using PCR to detect bacterial 16S r ibosomal DNA. *Oxford Ophthalmological Congress.*
4. Jenkins C, Sherman L, **Tobal K**, Rose G, Lightman S (1993)
   Gene rearrangement in orbital lymphoma. *Oxford Ophthalmological Congress.*
5. **Tobal K**, Grey M, Saunders M, Lucas G, Liu Yin JA (1994)
   Persistence of RARA-PML transcripts in patients in long term remission of acut e promyelocytic leukaemia. *Br. J. Haematol.,* 86, suppl. 1, a45.
6. Saunders MJ, **Tobal K**, Liu Yin JA (1994)
   Detection of (8;21) translocation in patients with AML M2 in remission. *Br. J.H aematol.,* 86 suppl. 1, a46.
7. Saunders MJ, **Tobal K**, Liu Yin JA (1995)
   Molecular diversity of runt-MTG8 transcripts detected during remission phase o f AML with t(8;21). *Br. J. Haematol.,* 89, suppl. 1, a207.
8. **Tobal K**, Johnson PRE, Saunders MJ, Harrison C, Liu Yin JA (1995)
   Molecular analysis of patients with inversion of chromosome 16 and abnormalit ies of 16q at presentation and in remission. *Br. J. Haematol.,* 89, suppl. 1, a209.

9. **Tobal K,** Liu Yin JA (1995)
   Detection of persistent PML-RAR positive cells in long-term remission of acu te promyelocytic leukaemia (APL) by a sensitive 'Hot-start' RT-PCR. *Br. J. Ha ematol.,* 89, suppl. 1, a214.
10. **Tobal K**, Liu Yin JA (1995)
    Persistence of PML-RARA transcripts in patients in long term remission of AP L detected by two new 'hot-start' RT-PCR methods. *Blood,* 86 (10), suppl 1, a1 310.
11. **Tobal K**, Liu Yin JA (1995)
    Monitoring minimal residual disease in patients with AML M2 and t(8;21) by q

uantitative RT-PCR. *Blood,* 86 (10), suppl 1, a1311.

12. Liu Yin JA, Saunders MJ, Keeney S, **Tobal K** (1995)
    Molecular diversity of RNA transcripts found in acute myeloid leukaemia M2 w ith t(8;21). *Blood,* 86 (10), suppl 1, a2923.
13. **Tobal K**, Patel L, Liu Yin JA (1996)
    Multiplex RT-PCR for detecting common AML chromosomal translocations. *Br . J. Haematol.,* 93, suppl. 1, pp 63.
14. **Tobal K**, Jones Y, Slater R, Liu Yin JA (1996)
    Clonality analysis by a new single allele amplification method. *Br. J. Haematol.* , 93, suppl. 1, pp 63.
15. **Tobal K**, Liu Yin JA (1996)
    Evaluation of quantitative RT-PCR in monitoring minimal residual disease in pa tients with AML M2 and t(8;21). *Br. J. Haematol.,* 93, suppl. 1, pp 63.
16. Saunders MJ, Brereton ML, Adams JA, **Tobal K**, Liu Yin JA (1996)
    Origin of cells expressing AML1-MTG8 transcripts in patients in remission of AML M2 with t(8;21). *Br. J. Haematol.,* 93, suppl. 1, pp 63.
17. Evans PAS, Norfolk DR, Child JA, Shiach CR, Short M, Jack A, **Tobal K**, Liu Yin JA, Morgan GJ (1996)
    Detection and quantitation of CBFB-MYH11 transcripts in presentation and foll ow up samples from AML patients with inv(16). *Br. J. Haematol.,* 93, suppl. 1, pp 62.
18. **Tobal K**, Liu Yin JA (1996)
    Quantitative assessment of minimal residual disease in patients with AML M2 a nd t(8;21). *Br. J. Haematol.,* 93, suppl. 2, a164.
19. **Tobal K**, Jones Y, Slater R, Liu Yin JA (1996)
    Single allele amplification: A new approach for clonality study. *Br. J. Haematol .,* 93, suppl. 2, a165.
20. Saunders MJ, Brereton ML, Adams JA, **Tobal K**, Liu Yin JA (1996)
    Persistence of multipotent progenitors expressing AML1-MTG8 transcripts in p atients in remission of AML M2 with t(8;21). *Br. J. Haematol.,* 93, suppl. 2, a85 0
21. Newton J, **Tobal K**, Liu Yin JA (1997)
    Peripheral blood as well as bone marrow samples can be used for the quantitatio n of AML1-MTG8 transcripts to assess effectiveness of treatment and predict re lapse. *Br. J. Haematol.,* 97, suppl. 1, a11.
22. Lambert DS, **Tobal K**, Ravenscroft PC, Hyde K, Liu Yin JA, Lucas GS (1997)
    Evaluation of a novel quantitative polymerase chain reaction method to monitor disease progression in CML/ALL patients. *Br. J. Haematol.,* 97, suppl. 1, a13.
23. **Tobal K**, Liu Yin JA (1997)
    Clonality analysis by competitive PCR amplification of a single allele to accurat ely estimate methylation level. *Br. J. Haematol.,* 97, suppl. 1, a208.
24. **Tobal K**, Kadkhudaei-Elyaderani M, Saunders MJ, Macheta M, Liu Yin JA (1997)
    Glutatnion S-transferases (GSTT1 and GSTM1) gene deletions are not increase d in acute myeloid leukaemia. *Br. J. Haematol.,* 97, suppl. 1, a209.
25. **Tobal K**, Newton J, Liu Yin JA (1997)
    Quantitation of AML1-MTG8 transcripts in peripheral blood or bone marrow sa mples can be performed to assess effectiveness of treatment and predict relapse. *Blood,* 90 (10), suppl 1, a1736.
26. **Tobal K**, Lambert DS, Kadkhudaei-Elyaderani M, Sekhon I, Macheta M, Liu Yin JA (1997)
    Glutathion S-transferases (GSTT1 and GSTM1) gene deletions are not increase d in myeloid leukaemias. *Blood,* 90 (10), suppl 1, a3743.
27. **Tobal K**, Lambert DS, Hyde K, Liu Yin JA, Lucas GS (1997)

A novel quantitative polymerase chain reaction method to monitor disease progr ession in CML/ALL patients. *Blood*, 90 (10), suppl 1, a4019.

28. Newton J, **Tobal K**, Morgenstern G, Chang J, Evans PAS, Morgan GJ, Liu Yin JA (1998) Identification of AML1-MTG8 fusion transcript levels in BM and PB samples that could distinguish patients in stable remission from those at risk of relapse in t(8;21) AML. *Br. J. Haematol.* 101, suppl 1, a34.
29. Newton J, **Tobal K**, Liu Yin JA (1998)
    Analysis of the expression level of normal AML1 and MTG8 genes in normal h aemopoetic cells and in acute myeloid leukaemia by semi-quantitative RT-PCR. *Br. J. Haematol.* 101, suppl 1, a63.
30. Lambert DS, **Tobal K**, Macheta M, Liu Yin JA (1998)
    Detection of PML-RARA transcripts in acute promyelocytic by in-cell RT-PCR . *Br. J. Haematol.* 101, suppl 1, a64.
31. Newton J, Cosgrove L, **Tobal K**, Liu Yin JA (1998)
    Analysis of gene expression produced by the exposure of NB4 cell line to ATR A and □-Interferon by differential display technique. *Br. J. Haematol.* 101, suppl 1, a65.
32. **Tobal K**, Lambert DS, Kadkhudaei-Elyaderani M, Sheikhha MH, Macheta M, Liu Yin JA (1999)
    Increased level of GST deletions in AML patients born after 1960 as compared t o those born before 1960 and to normal individuals. *Br. J. Haematol.* 105 suppl 1, a198.
33. **Tobal K**, Lambert DS, Kadkhudaei-Elyaderani M, Sheikhha MH, Macheta M, Liu Yin JA (1999)
    detection of higher levels of glutathione s-transferase deletions in AML patients born after 1960. *Haematologica* suppl. 1. PO 606. (EHA meeting)
34. **Tobal K**, Macheta M, Liu Yin JA (1999)
    Competitive RT-PCR for quantitating PML-RARA and monitoring minimal resi dual disease in acute promyelocytic leukaemia. *Haematologica* suppl. 1 PO 418. (EHA meeting)
35. **Tobal K**, Macheta M, Moore H, Liu Yin JA (1999)
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88. Other Abstracts in BSH, EHA , ASH, EACR and Lung cancer meetings.

2. Other research achievement

1. Peer reviewing for international j ournals which includes:
    a. *Blood*
    b. *Leukemia*

c. *Cancer Detection and prevention*
d. *European J. Haematol.*
e. *Haematologica/The Hematology Journal*
f. *Br. J. Haematol.*
g. *Molecular Probes*
h. *Int. J. Cancer*

2. Member:
   A. of the European Network of Excellence in Leukaemia (European LeukemiaNet).
   B. NICE cancer molecular diagnostic evaluation group.
3. Grant reviews for:
   A. LRF
   B. TENOVUS- Wales
   C. Italian Leukemia Research Grant
   D. Research Grants Council of Hong Kong

3. Organisation and promotion of research

Grants awarded since 1992

1. 1992 The use of polymerase chain reaction to detect metastatic uveal melanoma cells in peripheral blood.
   The Guide Dogs for the Blind Association 2 years, £50,000
2. 1997 Molecular monitoring of minimal residual disease in acute myeloid leukaemia AML (M2) with t(8;21) by a quantitative RT-PCR technique.
   Leukaemia Research Fund (LRF) 2 years, £58,000
3. 1998 Monitoring of minimal residual disease by quantitation of WT1 gene transcripts in acute myeloid leukaemia.
   Leukaemia Research Fund (LRF)
   2 years, £76,000
4. 2000 Molecular monitoring of minimal residual disease by real-time RT-PCR in t(8;21) and WT1 positive acute myeloid leukaemia patients.
   Leukaemia Research Fund (LRF)
   2 years, £88,000
5. 2002 The use of TNF related apoptosis inducing ligand (TRAIL) in combination with chemotherapeutic agents for the treatment of acute myeloid leukaemia (AML).
   CMHT R&D 1 year, £7,000
6. 2002 Molecular Monitoring of MRD by real-time quantitative RT-PCR in core binding and WT1 positive AML patients entered in the MRC AML 15 trial.
   Leukaemia Research Fund (LRF) 3 years, £276,000
7. 2002 Global amplification for lymphoma diagnosis and monitoring.
   New and emerging applications of technology programme.
   NEAT programme 3 years, £289,000
1. 2010 EGFR enabling studies. Roche Pharma- 1 year, £305,268
2. Next Generation Sequencing analysis for cancer diagnostics.- Financial benefactor 2 years £280,000

4. Statement on research

My research interest is into cancer molecular profiling, molecular pathology of cancer s and the evaluation of the clinical relevance of genetic abnormalities in cancers. This interest involves the development of new sensitive assays for the evaluation of various genetic aberrations.

Translational medicine research is a growing field and is essential for the improvemen t in our understanding of the different diseases and the delivery of better diagnostics a nd treatment/management of these diseases. One field where translational medicine re search is taking an important role in the development of new targeted therapies is canc er.

Presently, I am evaluating a new technique I have developed to isolate and identify gl obal genetic aberrations without the need for whole genome sequencing to identify su ch aberrations. This technique is a new development on NGS, which should enable lar ge scale investigations on large cohorts of patients with a specific cancer or disease st atus. I plan to employ this technique to investigate the molecular pathology and identify ne w diagnostics/prognostics markers in various cancers. Part of the difficulties with usin g WGS is the cost of such analysis, which is inhibitory for large scale analysis, and th e volume of data collected for analysis to identify genetic aberrations. The ability of th e new technique to only select genetic aberrations in samples analysed which are relat ed to the disease should enable large scale analysis to identify all important genetic ab errations and the investigation of the correlations between these aberrations and diseas e pathology, prognostics and response to specific treatments.

My previous research work:

On solid cancers:

Investigation of p53 mutation and cellular infiltration in melanoma.

I have also supervised an M.D. project on the detection and characterisation of bac terial infection in post-operative endophthalmitis.

- My research interest is in molecular profiling of various cancers and their clinical implication in relation to diagnosis, prognosis and response to various treatments.
- Supervision of Ph.D. studies investigating the molecular profiling of various cancers (medulloblastomas, ependymomas, breast cancer, ovarian and colorectal cancers.
- Collaborative research with oncologists colleagues at KHP on the molecular pathology of lung cancer.
- Collaborative studies with colleagues at the Liver unit/KCH on the molecular pathology of liver tumours.
- NGS investigations in cancer. I am working on the development and validation of cancer-specific NGS panel assays for use in the genetic profiling of cancer patients and identify patients who could respond to specific targeted therapy.

On haematological malignancies included investigations of genetic mutation (RAS a nd FMS genes) and rearrangement (including MYB and MYC) in AML and MDS.

In my previous position at the MRI/Manchester and present post at KCL, I am leading research work on different aspects of molecular and cellular biology of leukaemogen esis. Below are some of my group research interests:

Molecular diagnosis and monitoring of minimal residual disease (MRD) in AML, CML, and ALL. The aim of this work is to establish and evaluate molecular techni ques for the detection and quantification of fusion genes associated with various ty pes of leukaemia. Quantifying residual disease in patients with leukaemia may ena ble us to distinguish patients in stable remission from those at high risk of relapse. We were successful in developing techniques for this purpose, and have published a

number of papers and scientific meeting presentations on this field. Myr group is considered nationally and internationally, as a centre of excellence on this field. We have also developed differential display techniques to isolate genes associated with the relapse in leukaemia, and to investigate changes in genetic expression pro duced by various drugs (such as ATRA and Interferon-□).

The investigation of genetic instability and abnormalities in mismatch repair genes in myeloid leukaemias.

- Investigation of genetic abnormalities (such as GSTT1 and GSTM1 deletions) associated with increased susceptibility to leukaemia. This work forms the basis of a Ph.D. project, I am supervising, and have produced data suitable for two papers to date (one submitted to Cancer Research, and another in preparation for submission soon).

  Gene therapy. This programme included the design and evaluation of ribozymes (RZ) and DNAzymes (DZ) targeted against fusion genes (such as PML-RARA) pr oduced in APL by the t(15;17). This work forms the basis of a Ph.D. project, I am supervising, and have produced data for presentation in two scientific meetings (B SH and EHA). Part of the data has been submitted for publication recently. Our w ork also included a research project to investigate anti-apoptotic genes (particularl y Survivin and XIAP) and their role in leukaemogenesis. We have designed a num ber of DNAzymes (DZs) targeting these two genes and have carried out the prelim inary work successfully. Transfection study of these DZs on myeloid leukaemic ce ll lines showed the ability of these DZs to induce apoptosis in leukaemic cells. Tw o abstracts on this work were published in *Blood* ASH abstracts supplement (abstr acts 45 and 49 in the abstracts list). I plan to use these data as the basis for a grant application very soon. This is an important work that may help to increase our und erstanding of the biological basis anti-apoptotic genes' activity in leukaemia and t he potential therapeutic value of targeting these genes in leukaemia.
- The development of a new strategy for MRD Monitoring in AML, which could be modified for MRD monitoring in other haematological malignancies. This strategy is based on the identification and evaluation of 6 AML-upregulated genes which can be used as MRD markers in all AML patients, providing multiple markers for each patients irrespective of the presence of fusion gene. A manuscript is in preparation and it will be used as a basis for a grant application to evaluate these markers on serial samples from a large cohort of patients. To date, I have received the agreement of 2 French Groups to collaborate in this study.
- NGS investigations in haematological malignancies. I have designed a number of NGS panels for various cancers including a diagnostics panel for MPN and AML.