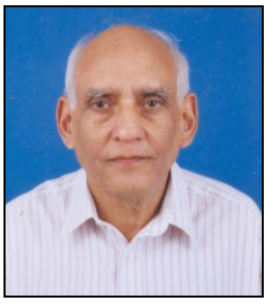
CURRICULUM VITAE



Name Professor Muhammad Akhtar, FRS

Address School of Biological Sciences,
University of the Punjab, New Campus,
Lahore 54590 – Pakistan.
Tel. Off. 92-42-9230-960
Tel. Res. 92-42-5727-723
Fax. Off. 92-42-9230-980
Email: sobs@cyber.net.pk

Occupation Emeritus Professor of Biochemistry at the University of Southampton
&
Distinguish National Professor Director General, School of Biological Sciences, University of the Punjab, New Campus, Lahore – Pakistan.

Birth date 23 February 1933; Batala, Punjab, India

Nationality British/Pakistani
Married to Monika E Schürmann; two sons: Marcus Imran and Daniel Azeem

Education

1952 Bsc	Government College, University of Punjab at Lahore, Pakistan
1954 Msc	(Gold Medallist) University of Punjab, Pakistan
1959 PhD	DIC Imperial College, University of London, UK.

Honours

1980	Fellow of the Royal Society, UK
1981	Sitara-I-Imtiaz, Government of Pakistan
1983-85	Member of the Council of the Royal Society
1984	Founding Fellow of the Third World Academy of Sciences
1992-1997	Treasurer & Member of Council of Third World Academy of Sciences
1993	Royal Society of Chemistry Flintoff Medal
1996	Third World Academy of Sciences Medal Lecturer
1997-2003	Vice President Third World Academy of Sciences
2000	Honorary DSc Degree of Karachi University
2000	Foreign Fellow of Pakistan Academy of Sciences

Career Positions:

1959-1963	Research Scientist, Research Institute, Cambridge, MA, USA
1963-	Department of Biochemistry, University of Southampton, UK:
1963-1966	Lecturer
1966-1968	Senior Lecturer
1968-1973	Reader
1973- 1998	Professor of Biochemistry
1978-1993	Head of Department of Biochemistry
1983-1987	Chairman, School of Biochemical & Physiological Sciences
1989-1990	Chairman, Institute of Biomolecular Sciences
1990-1994	Director, SERC Molecular Recognition Centre
1998-	Emeritus Professor of Biochemistry
2002-todate	Director General, School of Biological Sciences, University of the Punjab.
2004-todate	Distinguished National Professor, Higher Education Commission, Islamabad.

Supervision of Research Students:

Supervision of 70 successful PhD students.

BIOGRAPHICAL DETAILS: PROFESSOR M AKHTAR

Professor M Akhtar was born at Batala (India) on 23 February 1933. He received his early school education in Mau (District, Azamgarh, India) and matriculated from the Muslim High School, Batala in 1948. The same year he joined Government College, Sargodha (Pakistan) and passed the Intermediate Science Examination in 1950, standing First in his college. He read Chemistry at Government College, Lahore and the University of Punjab at Lahore, obtaining a Gold Medal in his Msc. For a short period, he joined Dr Bashir Ahmed team and was one of the three Research Scholars (the other two being Dr R U Qureshi and Dr Amir Muhammad) who formed the nucleus staff of PCSIR Lahore. It is quite possible that he might have been the first person to light a Bunsen burner - at the time a prized possession of young Pakistani chemists - in a temporary laboratory at the present site. He came to the UK in 1956 and completed his PhD research under the supervision of Prof. B C L Weedon, FRS at Imperial College, London in 1959. He then worked for four years as a Research Associate under the Nobel Laureate Sir Derek Barton FRS at the Research Institute of Medicine and Chemistry, Cambridge, Massachusetts, USA on the development and delineation of the mechanism of the Barton Reaction.

He was appointed to a Lectureship at the University of Southampton in 1963 and became a Professor in 1973. He was the holder of the only established Chair of Biochemistry in the Faculty of Science as well as Medicine of the University until his retirement in 1998. He is now the Emeritus Professor of Biochemistry. He was the Head of Department of Biochemistry from 1978-1993 and also the Chairman of the School of Biochemical and Physiological Sciences from 1978-1987. At the last count, 60 individuals had successfully completed their PhDs under his supervision. Even though a rather discriminating author, he has published more than 160 original research papers in refereed journals and many specialist chapters in technical books.

He was elected to the Royal Society in 1980 and has served on the Council of the Royal Society and its various Committees. He was the recipient of the *Sitara-I-Imtiaz* from the Government of Pakistan and the Flintoff Medal from the Royal Society of Chemistry. He is one of the Founding Fellows of the Third World Academy of Sciences. He is currently the Vice President of the Academy and has been its Treasurer and also the Chairman of Biochemistry & Molecular Biology Committee, and is the recipient of the 1996 Medal of the Academy.

His research has been concerned with *The elucidation of the stereochemistry and chemical mechanisms of enzymes involved in the biosynthesis of complex natural products and studies on visual proteins.* He has been at the forefront of applying the principles of stereochemistry and mechanistic organic chemistry to the elucidation of a wide variety of biological problems. The strategy initiated by him nearly a quarter of a century ago has culminated in the delineation of the basic molecular mechanisms through which biological systems may carry out complex chemical transformations. He has contributed to the understanding of the mechanisms through which the intricate architectures of cholesterol and ergosterol are elaborated by mammalian liver and yeast respectively, haem which is one of the components of the oxygen carrying protein, haemoglobin, is produced in the red blood cells and sex hormones, androgen and oestrogen are biosynthesised in gonads. Apart from their relevance to biosyntheses, cumulatively these studies defined the complete substrate stereochemistry of at least a dozen enzymes and also shed new light on their catalytic mechanisms. In many instances the mechanistic principles signalled by these investigations were found to typify a general phenomenon. The enzymes falling in this category are those involved in the following reactions:

1. The reduction of olefinic linkages, e.g. $\Delta^{5,6}$, $\Delta^{14,15}$ and $\Delta^{24,25}$-reductases;
2. S-adenosylmethionine dependent C-methylation in ergosterol biosynthesis;
3. oxidative desaturases, e.g. $\Delta^{5,6}$-desaturase and protoporphyrinogen IX oxidase;
4. pyridoxal phosphate dependent C-C bond formation, e.g. serine hydroxylmethyltransferase and 5-aminolaevulinic acid synthase;
5. cofactor independent non-oxidative and oxidative decarboxylations, e.g. uroporphyrinogen decarboxylase and coproporphyrinogen oxidase.

More importantly, the work on oestrogen biosynthesis was seminal in highlighting that certain P-450 group of enzymes catalyse a diverse range of generic reactions at a single active site. This discovery prompted a critical analysis of the chemical features of iron-containing-oxygen-binding proteins and led to the proposal of a unified hypothesis which views a wide variety of biological oxidation processes as variations on a common mechanistic theme. The insight provided by such studies is helping in designing a novel class of antioestrogens which have potential use in the treatment of one particular type of breast cancer. Another area of research being pursued in his laboratory uses the modern techniques of recombinant DNA technology and is directed to unearth the mechanisms underlying the production of antibiotics by microorganism and also the origin of antibiotic resistance in clinical isolates.

His longstanding interest in the vision field which is distinguished by his pioneering studies at the elucidation of the mode and site of binding of the retinal chromophore in bovine rhodopsin has found general application to other classes of retinal-based proteins. Now the primary sequences of a large number of visual proteins including four from human eye have been elucidated by other workers using either protein or DNA sequencing. In all these cases the site of retinal-binding was inferred from Professor Akhtar□s original experimental work on bovine rhodopsin. His group was also the first to describe the structure of bovine rhodopsin in terms of seven trans-membrane segments. This latter feature which was subsequently confirmed in other laboratories using more advanced approaches seems to have been conserved in the structures of all animal rhodopsins described to date. In the recent years his research in the field is moving towards the exciting goal of understanding the molecular mechanisms through which rhodopsin after being activated by light interacts with other proteins of the retina setting the stage first for the transmission of message to brain and then termination of the signal in preparation for the next event. The latter scenario is accomplished by two enzymes, rhodopsin kinase, which was discovered by others and phosphoopsin phosphates described by Akhtar. Furthermore, his group has shed new light on the mechanism action of rhodopsin kinase.

Professor M. Akhtar
PUBLICATIONS

1. The formation of vinylacetylenes from copper acetylides.
   M. Akhtar and B.C.L. Weedon.
   J. Chem. Soc. 303 (1958)

2. Studies with acetylenes. Part III: The synthesis of three partly-*cis*-diphenyl-octatetraenes.
   M. Akhtar, T.A. Richards and B.C.L. Weedon.
   J. Chem. Soc. 933-940 (1959)

3. Carotenoids and related compounds. Part VIII: Novel synthesis of echinenone and canthaxanthin.
   M. Akhtar and B.C.L. Weedon.
   J. Chem. Soc. 4058-4062 (1959)

4. The photochemical rearrangement of hypochlorites.
   M. Akhtar and D.H.R. Barton
   J. Am. Chem. Soc. **83**, 2213 (1961)

5. A convenient synthesis of 19-norsteroids.
   M. Akhtar and D.H.R. Barton
   J. Am. Chem. Soc. **84**, 1496 (1962)

6. The synthesis of substituted aldosterone.
   M. Akhtar, D.H.R. Barton, J.M. Beaton and A.G. Hortmann
   J. Am. Chem. Soc. **85**, 1512-1519 (1963)

7. The mechanism of the Barton Reaction.
   M. Akhtar and M.M. Pechet
   J. Am. Chem. Soc. **86**, 265-268 (1964)

8. Reactions at position 19 in the steroid nucleus: A convenient synthesis of 19-norsteroids.
   M. Akhtar and D.H.R. Barton
   J. Am. Chem. Soc. **86**, 1528-1536 (1964)

9. Some recent developments in the photochemistry or organic nitrites and hypohalites.
   M. Akhtar
   Advances in Photochemistry **2**, 263-303 (1964)

10. A convenient synthesis of vitamin D_3-9, 19-^{3}H and the mechanism of the previtamin D_3 vitamin D_3 reaction.
    M. Akhtar and C.J. Gibbons.
    Tetrahedron Letters 509-512 (1965)

11. Silver-catalyzed decomposition of hypobromites.
    M. Akhtar, P. Hunt and P.B. Dewhurst.
    J. Am. Chem. Soc. 87, 1807 (1965)

12. Synthesis of rings A and B of strophanthidin.
    M. Akhtar and P.F. Hunt.
    J.C.S. Chem. Comm. 199 (1965)

13. Some radical exchange reactions during nitrite ester photolysis.
    M. Akhtar, D.H.R. Barton and P.G. Sammes.
    J. Am. Chem. Soc. **87**, 4601 (1965)

14. A convenient synthesis of [9,19-$^{3}H_2$] cholecalciferol 3,5-dinitrobenzoate and the mechanism of the precholecalciferol cholecalciferol reaction.
M. Akhtar and C.J. Gibbons.
J. Chem. Soc. 5964-5968 (1965)

15. The reduction of a rhodopsin derivative.
M. Akhtar, P.T. Blosse and P.B. Dewhurst.
Life Sciences **4**, 1221-1226 (1965)

16. The synthesis of labelled 24-methylenelanosterol and its conversion into ergosterol.
M. Akhtar, M.A. Parvez and P.F. Hunt.
Biochem. J. **100**, 38c (1966)

17. The mechanism of the alkylation step in ergosterol biosynthesis.
M. Akhtar, P.F. Hunt and M.A. Parvez.
J.C.S. Chem. Comm. 565 (1966)

18. Synthesis of a medium-size ring via alkoxy radical decomposition.
M. Akhtar and S. Marsh.
J. Chem. Soc. 937-942 (1966)

19. The obligatory intermediacy of a cholesta-5,7-diene system in the hepatic biosynthesis of cholesterol.
M. Akhtar, D.C. Wilton and K.A. Munday.
Biochem. J. **101**, 23c (1966)

20. The conversion of 7-dehydrocholesterol into cholesterol.
D.C. Wilton, M. Akhtar and K.A. Munday.
Biochem. J. **98**, 29c (1966)

21. The transfer of hydrogen from C-24 to C-25 in ergosterol biosynthesis.
M. Akhtar, P.F. Hunt and M.A. Parvez.
Biochem. J. **103**, 616-622 (1967)

22. The stereochemistry of the hydrogen elimination in the biological conversion of cholest-7-en-3ß-ol into cholesterol.
M. Akhtar and S. Marsh.
Biochem. J. **102**, 462-467 (1967)

23. The conversion of cholest-7-en-3ß-ol into cholesterol: General comments on the mechanism of the introduction of double bonds in enzymic reactions.
S. Marsh Dewhurst and M. Akhtar.
Biochem. J. **105**, 1187-1193 (1967)

24. The active site of the visual protein, rhodopsin.
M. Akhtar, P.T. Blosse and (in part) P.B. Dewhurst.
J.C.S. Chem. Comm. 631-632 (1967)

25. The mechanism of the action of δ-aminolaevulinate synthetase and the synthesis of stereospecifically tritiated glycine.
M. Akhtar and P.M. Jordan.
J.C.S. Chem. Comm. 1691-1692 (1968)

26. The introduction of the C-22-C-23 ethylenic linkage in ergosterol biosynthesis.
M. Akhtar, M.A. Parvez and P.F. Hunt.
Biochem. J. **106**, 623-626 (1968)

27. The biological conversion of 7-dehydrocholesterol into cholesterol and comments on the reduction of double bonds.
D.C. Wilton, K.A. Munday, S.J.M. Skinner and M. Akhtar.
Biochem. J. **106**, 803-810 (1968)

28. The removal of the 14-methyl group in cholesterol biosynthesis.
M. Akhtar, I.A. Watkinson, A.D. Rahimtula, D.C. Wilton and K.A. Munday.
J.C.S. Chem. Comm. 1406-1407 (1968)

29. The intermediary role of a 19-oxoandrogen in the biosynthesis of oestrogen.
M. Akhtar and S.J.M. Skinner.
Biochem. J. **109**, 318-321 (1968)

30. The transfer of the double bond from 8(9) to 7(8) in cholesterol biosynthesis.
M. Akhtar and A.D. Rahimtula.
J.C.S. Chem. Comm. 259-260 (1968)

31. Oestrogen-induced calcium-binding protein in *Xenopus laevis*.
K.A. Munday, A.Q. Ansari, D. Oldroyd and M. Akhtar.
Biochim. Biophys. Acta **166**, 748-751 (1968)

32. The mechanism of the elaboration of ring B in ergosterol biosynthesis.
M. Akhtar and M.A. Parvez.
Biochem. J. **108**, 7705-7709 (1968)

33. The formation of an 8,14-diene system during cholesterol biosynthesis.
I.A. Watkinson and M. Akhtar.
J.C.S. Chem. Comm. 206 (1969)

34. The origin of the 14 -hydrogen in cholesterol biosynthesis.
M. Akhtar, A.D. Rahimtula, I.A. Watkinson, D.C. Wilton and K.A. Munday.
J.C.S. Chem. Comm. 149 (1969).

35. The incorporation of a hydrogen atom at C-15 of cholesterol biosynthesised from squalene.
M. Akhtar, A.D. Rahimtula and D.C. Wilton.
Biochem. J. **114**, 801-806 (1969)

36. Speculative article: The Biochemical role of vitamin B_{12}.
M. Akhtar
Comp. Biochem. Physiol. **28**, 1-9 (1969)

37. The role of a cholesta-8,14-dien-3β-ol system in cholesterol biosynthesis.
M. Akhtar, I.A. Watkinson, A.D. Rahimtula, D.C. Wilton and K.A. Munday.
Biochem. J. **111**, 757-761 (1969)

38. The stereospecific removal of a C-19 hydrogen atom in oestrogen biosynthesis.
S.J.M. Skinner and M. Akhtar.
Biochem. J. **114**, 75-81 (1969)

39. The conversion of steroid 7,9-dienes into cholesterol.
A.D. Rahimtula, D.C. Wilton and M. Akhtar.
Biochem. J. **112**, 545-546 (1969)

40. The status of C-6, C-7, C-15 and C-16 hydrogen atoms in cholesterol biosynthesis.
M. Akhtar, A.D. Rahimtula, I.A. Watkinson, D.C. Wilton and K.A. Munday.
Eur. J. Biochem. **9**, 107-111 (1969)

41. The reversibility of the Δ^8-cholesterol-Δ^7-cholesterol isomerase reaction in cholesterol biosynthesis.
D.C. Wilton, A.D. Rahimtula and M. Akhtar.
Biochem. J. **114**, 71-73 (1969)

42. Studies on the biosynthesis of the ergosterol side chain.
M. Akhtar, M.A. Parvez and P.F. Hunt.
Biochem. J. **113**, 727-732 (1969)

43. Studies on vision: The nature of the retinal-opsin linkage.
M. Akhtar, P.T. Blosse and P.B. Dewhurst.
Biochem. J. **110**, 693 (1969)

44. The absolute configuration of stereospecifically tritiated glycines.
M. Akhtar and P.M. Jordan.
Tetrahedron Lett. **11**, 875-877 (1969)

45. The mechanism of action of serine transhydroxymethylase.
P.M. Jordan and M. Akhtar.
Biochem. J. **116**, 277-286 (1970)

46. A convenient synthesis of labelled rhodopsin and studies on its active site.
M.D. Hirtenstein and M. Akhtar.
Biochem. J. **119**, 359-366 (1970)

47. The stereochemistry of hydrogen elimination from C-7 in cholesterol and ergosterol biosynthesis.
M. Akhtar, A.D. Rahimtula and D.C. Wilton.
Biochem. J. **117**, 539-542 (1970)

48. The formation and reduction of the 14,15-double bond in cholesterol biosynthesis.
I.A. Watkinson, D.C. Wilton, K.A. Munday and M. Akhtar. Biochem.J. 121, 131-137 (1971)

49. Studies on the induction and biosynthesis of vitellogenin, an oestrogen-induced glycolipophosphoprotein.
P.J. Dolphin, A.Q. Ansari, C.B. Lazier, K.A. Munday and M. Akhtar.
Biochem. J. **124**, 751-758 (1971)

50. Reaction mechanisms, Part (iii): Enzyme mechanisms.
M. Akhtar and D.C. Wilton.
Annual Report of the Chemical Society B, 167-186 (1971)

51. The pathway for the removal of C-32 in cholesterol biosynthesis.
K.T.W. Alexander, M. Akhtar, R.B. Boar, J.F. McGhie and D.H.R. Barton.
J.C.S. Chem. Comm. 1479-1481 (1971)

52. The substrate activation in some pyridine nucleotide linked enzymic reactions: The conversion of desmosterol into cholesterol.
I.A. Watkinson, D.C. Wilton, A.D. Rahimtula and M. Akhtar.
Eur. J. Biochem. 23, 1-6 (1971)

53. Chemical composition of an oestrogen-induced calcium-binding glycolipophosphoprotein in *Xenopus laevis*.
A.Q. Ansari, P.J. Dolphin, C.B. Lazier, K.A. Munday and M. Akhtar.
Biochem. J. **122**, 107-113 (1971)

54. Short communications. Studies on the control of cholesterol biosynthesis: The adenosine 3□:5□-cyclic monophosphate-dependent accumulation of a steroid carboxylic acid.
D.P. Bloxham and M. Akhtar.
Biochem. J. **123**, 275-278 (1971)

55. Studies on the mechanism and regulation of C-4 demethylation in cholesterol biosynthesis: The role of adenosine 3□:5□-cyclic monophosphate.
D.P. Bloxham, D.C. Wilton and M. Akhtar.
Biochem. J. **125**, 625-634 (1971)

56. The preparation of chloromethylketone analogues of amino acids: Inhibition of leucine aminopeptidase.
P.L. Birch, H.A. El-Obeid and M. Akhtar.
Arc. of Biochem. and Biophys. **148**, 447-451 (1972)

57. Inactivation of serine transhydroxymethylase and threonine aldolase activities.
M. Akhtar and H.A. El-Obeid.
Biochim. Biophys. Acta **258**, 791-799 (1972)

58. An anti-anabolic role of adenosine 3□:5□-cyclic monophosphate in the control of liver metabolism: A hypothetical mechanism for gluconeogenesis.
D.P. Bloxham and M. Akhtar.
Int. J. Biochem. **3**, 294-308 (1972)

59. The removal of the 32-carbon atom as formic acid in cholesterol biosynthesis.
K. Alexander, M. Akhtar, R.B. Boar, McGhie, J.F. and D.H.R. Barton.
J.C.S. Chem. Comm. 383-385 (1972)

60. Mechanism and stereochemistry of vinyl group formation in haem biosynthesis.
Z. Zaman, M.M. Abboud (in part) and M. Akhtar.
J.C.S. Chem. Comm. 1263-1264 (1972)

61. The regeneration of rhodopsin from all-trans-retinal: Solubilisation of an enzyme system involved in the completion of the visual cycle.
S. Amer and M. Akhtar.
Biochem. J. **128**, 987-989 (1972)

62. Substrate activation in pyridine nucleotide-linked reactions: Illustrations from the steroid field.
M. Akhtar, D.C. Wilton, I.A. Watkinson and A.D. Rahimtula.
Proc. R. Soc. Lond. B **180**, 167-177 (1972)

63. Mechanism and stereochemistry of the 5-aminolaevulinic synthetase reaction.
Z. Zaman, P.M. Jordan and M. Akhtar.
Biochem. J. **135**, 257-263 (1973)

64. Reaction mechanisms, part (iii): Enzyme mechanisms.
M. Akhtar and D.C. Wilton.
Annual Report of the Chemical Society B, 140-159 (1972)

65. Studies on a missing reaction on the visual cycle.
S. Amer and M. Akhtar.
Nature New Biology **237**, 266-267 (1972)

66. Studies on the regeneration of rhodopsin from all-trans-retinal in isolated rat retinae.
S. Amer and M. Akhtar.
Nature New Biology **245**, 221-223 (1973)

67. Studies on the assembly and secretion of a multicomponent protein: The biosynthesis of vitellogenin, an oestrogen-induced glycolipophosphoprotein.
A.H. Merry, P.J. Dolphin, K.A. Munday and M. Akhtar.
Biochem. J. **132**, 459-463 (1973)

68. Reaction mechanisms, part (iii): Enzyme mechanisms.
M. Akhtar and D.C. Wilton.
Annual Report of the Chemical Society B, 63 (1973)

69. Studies on amino acid receptors from neurones of *Helix aspersa*.
M. Akhtar, M.J. Azanza, G.A. Kerkut, S.M. Piggott, C.G. Rasool,R.J. Walker and G.N. Woodruff.
Journal of Physiology **232**, 63-63 (1973)

70. Anti-anabolic effects of adenosine 3□:5□-cyclic monophosphate: Inhibition of protein synthesis. A. Sellers, D.P. Bloxham, K.A. Munday and M. Akhtar.
Biochem. J. **138**, 335-340 (1974)

71. Biosynthesis of 5-aminolevulinic acid: involvement of a retention-inversion mechanism.
M.M. Abboud, P.M. Jordan and M. Akhtar.
J.C.S. Chem. Comm. 643-644 (1974)

72. Labelling of amino-acid side-chains with ^{13}C-labelled electrophiles: Potential application to the probing of active sites of enzymes.
I.J.G. Climie, D.A. Evans and M. Akhtar.
J.C.S. Chem. Comm. 160-161 (1975)

73. The mechanism of the bond forming events in pyridine nucleotide linked oxidoreductases: Studies with epoxide inhibitors of lactic dehydrogenase and ß-hydroxybutyrate dehydrogenase.
D.P. Bloxham, I.G. Giles, D.C. Wilton and M. Akhtar.
Biochemistry **14**, 2235-2241 (1975)

74. Stereochemistry of the glycine reductase of *Clostridium sticklandii*.
G. Barnard and M. Akhtar.
J.C.S. Chem. Comm. 980-982 (1975)

75. The role of a 5α-hydroxylated intermediate in the formation of the 5,6-double bond in cholesterol biosynthesis.
K. Alexander and M. Akhtar.
Biochem. J. **145**, 345-352 (1975)

76. The requirement for a membrane component to demonstrate the inhibition of cell-free protein synthesis by cyclic AMP.
A. Klaipongpan, D.P. Bloxham and M. Akhtar.
FEBS Lett. **58**, 81-84 (1975)

77. The mechanism of C-4 demethylation during cholesterol biosynthesis: Evidence for a decarboxylation mechanism not involving a schiff-base intermediate.
D.C. Wilton and M. Akhtar.
Biochem. J. **149**, 233-235 (1975)

78. Mechanistic, inhibitory and stereochemical studies on cytoplasmic and mitochondrial serine transhydroxylases.
M. Akhtar, H.A. El-Obeid and P.M. Jordan.
Biochem. J. **145**, 159-168 (1975)

79. Stereochemistry of porphyrinogen carboxylase reaction in haem biosynthesis.
G.F. Barnard and M. Akhtar.
J.C.S. Chem. Comm. 494-496 (1975)

80. Stereospecificity of oxidation at C-19 in oestrogen biosynthesis.
D. Arigoni, R. Battaglia, M. Akhtar and T. Smith.
J.C.S. Chem. Comm. 185-186 (1975)

81. Mechanism and stereochemistry of vinyl group formation in haem biosynthesis.
Z. Zaman and M. Akhtar.
Eur. J. Biochem. **61**, 215-223 (1976)

82. Mechanism of C-2-C-3 bond formation and cleavage in serine transhydroxymethylase reactions.
P.M. Jordan, H.A. El-Obeid, D.L. Corina and M. Akhtar.
J.C.S. Chem. Comm. 73-74 (1976)

83. The assymetric distribution of enzymic activity between the six subunits of bovine liver glutamate dehydrogenase: Use of D- and L-glutamyl-chloromethyl ketones (4-amino-6-chloro-5-oxohexanoic acid).
C.G. Rasool, S. Nicolaidis and M. Akhtar.
Biochem. J. **157**, 675-686 (1976)

84. Mechanism and stereochemistry of enzymic reactions involved in porphyrin biosynthesis.
M. Akhtar, M.M. Abboud, G. Barnard, P. Jordan and Z. Zaman.
Phil. Trans. R. Soc. Lond. B. 273, 117-136 (1976)

85. The role of the pseudo-disaccharide neamine as an intermediate in the biosynthesis of neomycin.
C.J. Pearce, J.E.G. Barnett, C. Anthony, M. Akhtar and S.D. Gero.
Biochem. J. **159**, 601-606 (1976)

86. A chiral synthesis of D-(+)-2,6-dideoxystreptamine and its microbial incorporation into novel antibiotics.
J. Cleophax, S.D. Gero, J. Leboul, M. Akhtar, J.E.G. Barnett and C.J. Pearce.
J. Am. Chem. Soc. **98**, 7110-7112 (1976)

87. Studies on the removal of C-19 in oestrogen biosynthesis using $^{18}O_2$.
M. Akhtar, D. Corina, J. Pratt and T. Smith.
J.C.S. Chem. Comm. 854-856 (1976)

88. Stereochemistry of hydrogen elimination in the enzymic formation of the C-2-C-3 double bond of porphobilinogen.
M.M. Abboud and M. Akhtar.
J.C.S. Chem. Comm. 1007-1008 (1976)

89. Studies on the biosynthesis, assembly and secretion of vitellogenin, an oestrogen-induced multicomponent protein.
T.M. Penning, A.H. Merry, K.A. Munday and M. Akhtar.
Biochem. J. **162**, 157-170 (1977)

90. Identification of the active site polypeptide in labelled photoreceptor membranes digested with papain.
P. Towner, G.J. Sale and M. Akhtar.
FEBS Letts. **76**, 51-55 (1977)

91. The pathway for the removal of the 14α-methyl group of lanosterol: The role of lanost-8-ene-3,ß 32-diol in cholesterol biosynthesis.
M. Akhtar, C.W. Freeman, D.C. Wilton, R.B. Boar and D.B. Copsey.
Bioorganic Chemistry **6**, 473-481 (1977)

92. Functional rhodopsin complex consisting of three noncovalently linked fragments.
G.J. Sale, P. Towner and M. Akhtar.
Biochemistry **16**, 5641-5649 (1977)

93. Chemical and enzymic studies on the characterisation of intermediates during the removal of the 14α-methyl group in cholesterol biosynthesis.
M. Akhtar, K. Alexander, R.B. Boar, J.F. McGhie and D.F. Barton.
Biochem. J. **169**, 449-463 (1978)

94. Sub-unit assembly in the biosynthesis of neomycin: The synthesis of 5-O-ß-D-ribofuranosyl and 4-O-ß-D-ribofuranosyl-2,6-dideoxystreptamines.
C.J. Pearce, M. Akhtar, J.E.G. Barnett, D. Mercier, A-M. Sepulchre and S.D. Gero.
J. Antibiotics **31**, 74-81 (1978)

95. Oestrogen-induced cholesterol and fatty acid biosynthesis in *Xenopus laevis* liver during vitellogenic response.
D.F. Smith, T.M. Penning, A.Q. Ansari, K.A. Munday and M. Akhtar.
Biochem. J. **174**, 353-361 (1978)

96. Enzymology of the porphyrin biosynthetic pathway: Synthesis and use of stereospecifically labelled porphobilinogen.
M.M. Abboud and M. Akhtar.
Nouveau Journal de Chimie **2**, 419-425 (1978)

97. Some biological transformations involving unsaturated linkages: The importance of charge separation and charge neutralisation in enzyme catalysis.
M. Akhtar and C. Jones.
Tetrahedron Report **34**, 1-20 (1978)

98. Topography of the rhodopsin molecule: Identification of the domain phosphorylated.
G.J. Sale, P. Towner and M. Akhtar.
Biochem. J. **175**, 421-430 (1978)

99. Stereospecific synthesis of chiral acetic acid from glycine.
M. Kajiwara, S.F. Lee, A.I. Scott, M. Akhtar, C.R. Jones and P.M. Jordan.
J.C.S. Chem. Comm. 967-968 (1978)

100. Stereospecificity of hydrogen removal from the four methylene bridges in haem biosynthesis: Specific incorporation of the 11 pro-S hydrogen of porphobilinogen into haem.
C. Jones, P.M. Jordan, (in part) A.G. Chaudhry and M. Akhtar.
J.C.S. Chem. Comm. 96-97 (1979)

101. Carotenoids and related compounds, part 35: Synthesis of ()-azafrin methyl ester and other α-glycols.
M. Akhtar, A.E. Faruk, C.J. Harris, G.P. Moss, S.W. Russell and B.C.L. Weedon.
J.C.S. Perkin Trans. **1**, 1511-1524 (1979)

102. Porphyrin, chlorophyll and corrin biosynthesis.
M. Akhtar and P.M. Jordan.
Comprehensive Organic Chemistry, vol V, 1121-1166 (1979)

103. The metabolism of cholecalciferol in the liver of Japanese Quail (Coturnix coturnix japonica) with particular reference to the effects of oestrogen.
R.A. Nicholson, M. Akhtar and T.G. Taylor.
Biochem. J. **182**, 745-750 (1979)

104. Mechanistic and stereochemical studies on the glycine reductase of *Clostridium sticklandii*.
G.F. Barnard and M. Akhtar.
Eur. J. Biochem. **99**, 593-603 (1979)

105. Stereochemical and mechanistic studies on the decarboxylation of uroporphyrinogen III in haem biosynthesis.
G.F. Barnard and M. Akhtar.
J.C.S. Perkin Trans. **1**, 2354-2360 (1979)

106. Stereospecific Synthesis of α-Aminoacyl Aldehydes and their Interaction with α-Chymotrypsin.
R.P. Sharma, M.G. Gore and M. Akhtar.
J.C.S. Chem. Comm. 875-877 (1979)

107. The incorporation of tritiated retinyl moiety into the active-site lysine residue of bacteriorhodopsin.
E. Mullen, M.G. Gore and M. Akhtar.
Biochem. J. **183**, 175-178 (1979)

108. Mechanistic and stereochemical studies on 3-oxo steroid Δ^4-Δ^5-isomerase from human placenta.
M. Akhtar, M. Calder, T. Smith and J.N. Wright.
Biochem. J. **185**, 411-421 (1980)

109. A proton-magnetic-resonance study of N-trifluoroacetyl-L- alanyl-L- phenylalaninal binding to α-chymotrypsin.
P. Wyeth, R.P. Sharma and M. Akhtar.
Eur. J. Biochem. **105**, 581-585 (1980)

110. Mechanism of the phytylation step in bacteriochlorophyll *a* biosynthesis.
A.A. Abid, D. Corina and M. Akhtar.
J.C.S. Chem. Comm. 511-513 (1980)

111. The regulation of 25-hydroxycholecalciferol metabolism in the kidney of Japanese Quail (Coturnix coturnix japonica) by sex hormones and by parathyroid extract.
S.H. Sedrani, T.G. Taylor and M. Akhtar.
General and Comparative Endocrinology **44**, 514-523 (1981)

112. The status of oxygen atoms in the removal of C-19 in oestrogen biosynthesis.
M. Akhtar, M.R. Calder, D.L. Corina and J.N. Wright.
J.C.S. Chem. Comm. 129-130 (1981)

113. The identification of Lys_{216} as the retinal binding residue in bacteriorhodopsin.
E. Mullen, A.H. Johnson and M. Akhtar.
FEBS Lett. **130**, 187-193 (1981)

114. Topographic and active-site studies on bovine rhodopsin.
E. Mullen and M. Akhtar.
FEBS Letts. **132**, 261-264 (1981)

115. Interaction of a conformationally rigid analogue of retinal with bacterio-opsin.
M. Akhtar, L. Jallo and A.H. Johnson.
J.C.S. Chem. Comm. 44-46 (1982)

116. Mechanistic studies on C-19 demethylation in oestrogen biosynthesis.
M. Akhtar, M.R. Calder, D.L. Corina and J.N. Wright.
Biochem. J. **201**, 569-580 (1982)

117. Mechanistic studies on the biosynthesis of the 2-deoxystreptamine ring of neomycins.
M.J.S. Ewad, W. Al-Feel and M. Akhtar.
J.C.S. Chem. Comm. 20-22 (1983)

118. Mechanism and stereochemistry of the elaboration of the neosamine C ring in the biosynthesis of neomycins.
W. Al-Feel, M.J.S. Ewad, C.J. Herbert and M. Akhtar.
J.C.S. Chem. Comm. 18-20 (1983).

119. Anaerobic and aerobic coproporphyrinogen III oxidases of Rhodopseudomonas spheroides: Mechanism and stereochemistry of vinyl group formation.
J.S. Seehra, P.M. Jordan and M. Akhtar.
Biochem. J. **209**, 709-718 (1983)

120. Structural studies on membrane-bound bovine rhodopsin.
E. Mullen and M. Akhtar.
Biochem. J. **211**, 45-54 (1983)

121. The sequence of an antibiotic resistance gene from an antibiotic producing bacterium: Homologies with transposon genes.
C.J. Herbert, I.G. Giles and M. Akhtar.
FEBS Letts. **160**, 67-71 (1983)

122. Structure and conformation of rhodopsin in the disc membrane.
M. Akhtar
Biochem. Soc. Trans. **11**, 668-672 (1983)

l23. Mechanism and Stereochemistry of the Porphobilinogen Deaminase and Protoporphyrinogen IX Oxidase Reactions: Stereospecific Manipulation of Hydrogen Atoms at the Four Methylene Bridges during the Biosynthesis of Haem.
C. Jones, P.M. Jordan and M. Akhtar.
J.Chem.Soc. Perkin Trans. **1** 2625-2633 (1984).

124. The mechanism of the attachment of esterifying alcohol in bacteriochlorophyll *a* biosynthesis.
M. Akhtar, A.A. Ajaz and D.L. Corina.
Biochem.J. **224**, 187-194 (1985).

125. Mechanistic Studies on the Phytylation Step in Bacteriochlorophyll *a* Biosynthesis: an Application of the $^{18}0$ Induced Isotope Effect in ^{13}C N.M.R. Spectroscopy.
V.C. Emery and M. Akhtar.
J.C.S.Chem.Commun., 600-601 (1985).

126. The mechanism of the C-13^3 esterification step in the biosynthesis of bacteriochlorophyll *a*.
A.A. Ajaz, D.L. Corina and M. Akhtar.
Eur.J. Biochem. **150**, 309-312 (1985).

l27. Synthesis of 19-Functionalised Derivatives of 16α-Hydroxy-testosterone: Mechanistic Studies on Oestriol Biosynthesis.
D.E. Stevenson, J.N. Wright (in part) & M. Akhtar.
J.C.S.Chem.Commun., 1078-1080 (1985).

128. Steroidal C-19 sulphur and nitrogen derivatives designed aromatase inhibitors.
J.N. Wright, M.R. Calder and M. Akhtar.
J.C.S.Chem.Commun. l733-1735 (1985).

129. Sequence and interspecies transfer of an aminoglycoside phosphotransferase gene (APH) of *Bacillus circulans*.
C.J. Herbert, M. Sarwar, S.S. Ner, I.G. Giles and M. Akhtar.
Biochem.J. **233**, 383-393 (1986).

130. Stereochemistry of the Generation of the Ethyl Group in Bacteriochlorophyll *a* Biosynthesis.
V.C. Emery and M. Akhtar.
J.C.S.Chem.Commun. 1646-1647 (1985).

131. The Synthesis and Use of Oligodeoxynucleotides in Plasmid DNA Sequencing.
S.S. Ner, D.P. Bloxham, P.A. Handford and M. Akhtar.
Int. J. Biochem. Vol. **18**, No. 3, pp. 257-262 (1986).

132. "Preparation of Sterospecifically Labelled Porphobilinogens".
M. Akhtar and C. Jones.
Methods in Enzymology, Vol.123, Part H, pp.375-383,
(eds. S.P. Colowich & N.O. Kaplan).

133. "Pyridoxal phosphate-dependent enzymic reactions: mechanism and stereochemistry"
M. Akhtar, V.C. Emery and J.A. Robinson
Comprehensive Biochemistry, ed. M.I. Page, Elsevier Biomedical Press,Amsterdam, Vol. **6**, p.303 (1986).

134. "Pyridoxal Phosphate Dependent Enzymes"
V.C. Emery and M. Akhtar.
Enzyme Mechanisms, ed. M.I. Page and A. Williams, Royal Society of Chemistry, Universities Press (Belfast) Ltd. p.345-386 (1987).

135. The Involvement of C-4 of D-Glucose in the Biosynthesis of the 2-Deoxystreptamine Ring of Neomysin.
S.K. Goda and M. Akhtar.
J.C.S., Chem.Commun. p. 12-14 (1987).

136. Mechanism of the Formation of the Two Epimeric Diamino-hexose Rings of Neomycin B.
S.K. Goda, W. Al-Feel and M. Akhtar.
J.Chem.Soc., Perkin Trans. **1**, p.1383-1389, (1987).

137. On the disulphide bonds of rhodopsins.
S. Al-Saleh, M. Gore and M. Akhtar.
Biochem. J., **246**, p.131-137, (1987).

138. Mechanistic studies on the phytylation and methylation steps in bacteriochlorophyll *a* biosynthesis: an application of the ^{18}O-induced isotope effect in ^{13}C NMR.
V.C. Emery and M. Akhtar.
Biochemistry, **26**, p.1200-1208, (1987).

139. Mechanistic consideration of P-450 dependant enzymic reactions: studies on oestriol biosynthesis.
D.E. Stevenson, J.N. Wright and M. Akhtar.
J.Chem.Soc. Perkin Trans. **I**, p.2043-2052, (1988).

140. Mechanistic studies on the phosphorylation or photoexcited rhodopsin.
C. Fowles, R.P. Sharma and M. Akhtar.
FEBS Letters, **238**, 56-60, (1988).

141. Inhibition of aromatase by steroids substituted at C-19 with halogen, sulphur, and nitrogen.
J.N. Wright, P.T. van Leersum, (in part) S.G. Chamberlin, and M. Akhtar.
J.Chem.Soc. Perkin Trans. **I** pp.1647-1655 (1989).

142. Interplay of phosphorylation and dephosphorylation in vision: Protein phosphatases of bovine rod outer segments.
C. Fowles and M. Akhtar.
Biochemistry, **28**, 9385-9391 (1989).

143. Cloning of aminoglycoside phosphotransferase (APH) gene from antibiotic-producing strain of *Bacillus circulans* into a high-expression vector, pKK223-3* - purification, properties and location of enzyme.
M. Sarwar and M. Akhtar.
Biochem. J., **268**, 671-677 (1990).

144. Studies on estrogen biosynthesis using radioactive and stable isotopes.
J.N. Wright and M. Akhtar.
Steroids Vol. **55**, pp.142-151 (1990).

145. Mechanistic studies on Pregnene side-chain cleavage enzyme (17α-hydroxylase-17,20-lyase) using ^{18}O.
Sharon L. Miller, J. Neville Wright, David L. Corina and Muhammad Akhtar.
J. Chem. Soc., Chem. Comms. **3**, 157-159 (1991).

146. The mechanism of cytochrome P-450 dependent C-C bond cleavage: studies on 17α-hydroxylase-17,20-lyase.
David L. Corina, Sharon L. Miller, J. Neville Wright and Muhammad Akhtar.
J. Chem. Soc., Chem. Comms. **3**, 157-159 (1991).

147. `Slow-binding' sixth-ligand inhibitors of cytochrome *P*-450 aromatase: Studies with 19-thiomethyl- and 19-azido-androstenedione.
J. Neville Wright, Guy Slatcher and Muhammad Akhtar.
Biochem. J. **273**, 533-539 (1991).

148. A unified mechanistic view of oxidative reactions catalysed by P-450 and related Fe-containing enzymes.
M. Akhtar and J.N. Wright.
Natural Products Reports, **8**, 527-612 (1991).

149. D-Alaninine:D-Alanine ligase of *Escherichia coli*. Expression, purification and inhibitory studies on the cloned enzymes.
Al-Bar, O., O'Connor, C.D., Giles, I.G. and Akhtar, M.
Biochem. J. **282**, 747-752 (1992).

150. Neomycin Biosynthesis: The incorporation of D-6-deoxyglucose derivatives and variously labelled glucose into the 2-deoxystreptamine ring. Postulated involvement of 2-deoxyinosose synthase in the biosynthesis.
Sayed K. Goda and Muhammad Akhtar.
The Journal of Antiobiotics, **45(6)**, 984-994 (1992).

151. Mechanistic studies on rhodopsin kinase: Light-dependent phosphorylation of C-terminal peptides of rhodopsin.
Neil G. Brown, Charles Fowles, Ram Sharma and Muhammad Akhtar
Eur. J. Biochem. **208**, 659-667 (1992).

152. Cooperativity during multiple phosphorylations catalysed by rhodopsin kinase: Supporting evidence using synthetic phosphopeptides.
N. Pullen, N.G. Brown, R.P. Sharma, M. Akhtar.
Biochem., , **32**, 3958-3964 (1993).

153. Phosphorylation of solubilised dark-adapted rhodopsin: Insights into the activation of rhodopsin kinase.
K.R. Dean and M. Akhtar.
Eur. J. Biochem., **213**, 881-890 (1993).

154. Mechanistic studies on aromatase and related C-C bond cleaving *P*-450 enzymes. Muhammad Akhtar, Vincent C.O. Njar & J. Neville Wright J. Steroid Biochem. Molec. Biol, **44** (4-6), 375-387 (1993).

155. Cooperativity during multiple phosphorylations catalysed by rhodopsin kinase: Supporting evidence using synthetic phosphopeptides. N. Pullen, N.G. Brown, R.P. Sharma, M. Akhtar, Biochem., **32**, 2958-3964 (1993).

156. Phosphorylation of solubilised dark-adapted rhodopsin: Insights into the activation of rhodopsin kinase. K.R. Dean & M. Akhtar, Eur. J. Biochem., **213**, 881-890 (1993).

157. Incorporation of label from $^{18}O_2$ into acetate during side-chain cleavage catalysed by cytochrome P-$450_{17\alpha}$(17α-hydroxylase-17,20-lyase). Muhammad Akhtar, David L. Corina, Sharon L. Miller, Akbar Z. Shyadehi & J. Neville Wright, J. Chem. Soc. Perkin Trans. **1**, 263-267 (1994).

158. Involvement of an O_2-derived nucleophilic species in acyl-carbon cleavage, catalysed by chtochrome P-$450_{17\alpha}$: Implications for related P-450 catalysed fragmentation reactions. Peter Robichaud, J. Neville Wright & Muhammad Akhtar, J. Chem. Soc. Chem. Commun. 1501-1503 (1994).

159. Rhodopsin Kinase: Studies on the sequence of the recognition motif for multiphosphorylations.
N. Pullen & M. Akhtar, Biochemistry, **33**, 14536-14542 (1994).

160. The phospho-opsin phosphatase from bovine rod outer segments: An insight into the mechanism of stimulation of type-2A protein phosphatase activity by protamine. Alastair J. King, Natasa Andjelkovic, Brian A. Hemmings & Muhammad Akhtar. Eur.J.Biochem., **225**, 383-394 (1994).

161. Mechanism of the acyl-carbon cleavage and related reactions catalyzed by multifunctional P-450s: Studies on cytochrome P-$450_{17\alpha}$. Muhammad Akhtar, David Corina, Sharon Miller, Akbar Z. Shyadehi & J. Neville Wright, Biochemistry, **33**, 4410-4418 (1994).

162. The modification of acetate and propionate side chains during the biosynthesis of haem and chlorophylls: Mechanistic and stereochemical studies.
M. Akhtar
In: Chadwick, D.J. and Ackrill, K. *eds*. The Biosynthesis of the Tetrapyrrole Pigments, Ciba Foundation Symposium 180, Chichester, John Wiley & Sons, 131-51. (1994).

163. A transition from ionic to free-radical mechanisms in chemistry and enzymology. Akhtar, M., Wright, J.N., Shyadehi, A.Z. and Robichaud, P.
Pure & Appl. Chem., 66(10/11), 2387-90 (1994).

164. A novel method of solid phase peptide synthesis.
Sharma, R.P., Jones, D.A., Broadbridge, R.J., Corina, D.L. and Akhtar, M. *In:* R.S. Hodges and J.A. Smith, *eds. Peptides: Chemistry, Structure and Biology*, Leiden, ESCOM, 127-9. (1994).

165. A novel method of solid phase synthesis of peptide analogues.
Sharma, R.P., Jones, D.A., Broadbridge, R.J., Corina, D.L. and Akhtar, M.
In: R. Epton, *ed. Innovation and Perspectives in Solid Phase Synthesis and Complementary Technologies - Biological and Biomedical Applications - 1994*, Birmingham, UK, Mayflower Worldwide Ltd., 353-6. (1994).

166. Mechanistic kinship between hydroxylation and desaturation reactions: acyl-carbon bond cleavage promoted by pig and human CYP17 (p-450(17 α);17 α-hydroxylase-17,20-lyase).
Lee-Robichaud P., Shyadehi A.Z., Wright J.N., Akhtar M.E. and Akhtar M. Biochemistry, 34, 14104-13 (1995).

167. Modulation of the activity of human 17 alpha-hydroxylase-17,20- lyase (CYP17) by cytochrome b(5): endocrinological and mechanistic implications.
Lee-Robichaud P., Wright J.N., Akhtar M.E. and Akhtar M.
Biochem. J., 308, 901-8 (1995).

168. New methods in solid phase peptide synthesis.
Sharma, R.P., Broadbridge, R.J., Jones, D.A., Corina, D.L. and Akhtar, M. *In:* Lu, G. and Tam, J.P., *eds. Peptides: Biology and Chemistry*, Leiden, ESCOM, 31-4 (1995).

169. Novel mechanism for the activation of rhodopsin kinase: Implications for other G protein-coupled receptor kinases.
Dean K.R. and Akhtar, M.
Biochemistry, **35**, 6164-6172 (1996).

170. The mechanism of the acyl-carbon bond cleavage reaction catalyzed by recombinant sterol 14α-demethylase of *Candida albicans* (other names are: Lanosterol 14α-demethylase, P-450_{14DM}, and CYP51).
Shyadehi, A.Z., Lamb, D.C., Kelly, S.L., Kelly, D.E., Schunck, W-H., Wright, J.N., Corina, D. and Akhtar, M.
J. Biol. Chem., **271**, 12445-12450 (1996).

171. Recoverin inhibits the phosphorylation of dark-adapted rhodopsin more than it does that of bleached rhodopsin: A possible mechanism through which rhodopsin kinase is prevented from participation in a side-reaction.
Senin, I.I., Dean, K.R., Zargarov, A.A., Akhtar, M. And Philippov, P.P.
Biochemical Journal, **321**, 551-555 (1997).

172. More losers than winners. M Akhtar.
Chemistry in Britain, , 36-38 May (1997).

173. The impact of aromatase mechanism on other P450s.
M. Akhtar, P. Lee-Robichaud, M.E. Akhtar and J. N. Wright.
J. Steroid Biochem. Molec. Biol. **61**, 3-6 (1997)

174. Molecular analysis of a *Clostridium butyricum* NCIMB 7423 gene encoding 4-α-glucanotransferase and characterization of the recombinant enzyme produced in *Escherichia coli*.
Sayed K. Goda, Omaima Eissa, Muhammad Akhtar, Nigel P. Minton.
Microbiology, **143**, 3287-3294 (1997)

175. The Mutation T315A in *Candida albicans* sterol 14α-demethyl causes reduced enzyme activity and fluconazole reistance through reduced affinity.
David C. Lamb, Diane E. Kelly, Wolf-Hagen Schunck, Akbar Z. Shyadehi, Muhammad Akhtar, David J. Lowe, Brian C. Baldwin, Steven L. Kelly.
J. Biol. Chem., **272**, 5682-5688 (1997)

176. Control of androgen biosynthesis in the human through the interaction of Arg^{347} and Arg^{358} of CYP17 with cytochrome b_5 .
Peter Lee-Robichaud, Monika E. Akhtar and Muhammad Akhtar
Biochem. J. **332**, 293-296 (1998)

177. The analysis of the role of active site protic residues of cytochrome P450s: Mechanistic and mutational studies on 17α-hydroxylase-17,20-lyase ($P450_{17\alpha}$ also CYP17).
P. Lee-Robichaud, M.E. Akhtar, M. Akhtar
Biochem. J. **330**, 967-974 (1998)

178. A discussion on the activation of oxygen in chemistry and enzymology.
M. Akhtar, P. Lee-Robichaud, J.N. Wright, M.E. Akhtar
Biochem. Soc. Trans. **26**, 322-325 (1998)

179. Lysine mutagenesis identifies cationic charges of human CYP17 which interact with cytochrome b_5 to promote male sex hormone biosynthesis.
P. Lee-Robichaud, M.E. Akhtar, M. Akhtar
Biochem. J. **342**, 309-312 (1999)

180. Isolation and Properties of Protein Phosphatase Type 2A in Photoreceptors.
M. Akhtar, A.J. King, N.E.M. McCarthy
Methods in Enzymology, Vol. 315, 557-570 (2000)
Academic Press.

181. Function of the farnesyl moiety in visual signalling.
N.E.M. McCarthy and M. Akhtar
Biochem. J. **347**, 163-171 (2000)

182. George Joseph Popjak
M. Akhtar
Biog. Mems Fell. R. Soc.
46, 403-424 (2000)

183. Activation of rhodopsin kinase
N. E. M. McCarthy and M. Akhtar
Biochem. J. **363**, 359-364 (2002)

184. Ca2+- dependent control of rhodopsin phosphorylation: recoverin and rhodopsin kinase.
I.I. Senin, K.W. Koch, M. Akhtar,
Adv. Exp. Med. Biol. **514,** 69-99 (2002).

185. Coproporhyrinogen III and protoporphyrinogen IX oxidases.
Muhammad Akhtar
In: K.M.Kadish, K.M. Smith, R.Guilard, Eds. The Porphyrin Handbook. The Iron and Cobalt Pigments: Biosynthesis, Structure, and Degradation. Volume **12**, 75-92 (2003).

186. The cationic charges on Arg^{347}, Arg^{358}, Arg^{449} of human cytochrome P450c17 (CRP17) are essential for the enzyme's cytochrome b_5-dependent acyl-carbon cleavage activities.
Peter Lee-Robichaud, Monika E. Akhtar and Muhammad Akhtar
J. of Steriod Biochem. & Mol. Biol. **92**, 119-130 (2004).

187. Mechanism and substrate stereochemistry of 2-amino-3-oxobutyrate CoA ligase: implications for 5-aminolevulinate synthease and related enzymes
Qamar Bashir, Naeem Rashid and Muhammad Akhtar
Chem. Commun. 5065-5067 (2006).

188. Crystallization and preliminary X-ray diffraction analysis of L-threonine dehydrogenase (TDH) from the hyperthermophilic archaeon *Thermococcus kodakaraenis*
A. Bowyer[a], H. Mikolajek[a], J.N. Wright[a], A. Coker[b], P.T. Erskine, [a,b] J. B. Cooper,[a,b*], Q. Bashir[c], N. Rashid,[c] F. Jamil[c] and M. Akhtar[a,c]
Acta Cryst. (2008) **F64:** 828-830.

189. Inventory of 'slow exchanging' hydrogen atoms in human proinsulin and its derivatives: Observations on the mass spectrometric analysis of deuterio-proteins in D_2O.
Qurra-tul-Ann Afza Gardner[a], Hooria Younas[a], Naeem Rashid[a], J. Neville Wright[b], Muhammad Akhtar,[b].*
Biochimica Biophysica Acta 1794 (2009) 1224-1233.

190. Highly Thermostble L-Threonine Dehydrogenase from the Hyperthermophilic Archaeon *Thermococcus kodakaraenis*
Qamar Bashir, Naeem Rashid, Farrukh Jamil, Tadayuki Imanaka and Muhammad Akhtar
Journal of Biochemistry 2009 Jul;146(1):95-102.

191. Structure and Function of the L-threonine Dehydrogenase (Tk TDH) from the hyperthermophilic archaeon Thermococcus kodakaraensis
A. Bowyer , H. Mikolajek , J.W. Stuart , S.P. Wood, F. Jamil , N. Rashid , M. Akhtar , J.B. Cooper.
Journal of structural Biology 168: 294–304 (2009).

192. Gene cloning and characterization of a xylanase from a newly isolated *Bacillus subtilis* strain R5.
Amir Jalal, Naeem Rashid, Nouman Rasool and Muhammad Akhtar.
J. Biosci. Biosci. Bioeng. 107: 360-365 (2009).

193. Mechanistic and stereochemical studies of Glycine oxidase from *Bacillus subtilis* strain R5.
Farrukh Jamil, Qurra-tul-Ann Afza Gardner, Qamar Bashir, Naeem Rashid and Muhammad Akhtar.
Biochemistry 49:7377-7383 (2010).

194. N-terminal deletion of Tk1689, a subtilisin-like serine protease from *Thermococcus kodakaraenis*, copes with its cytotoxicity in *Escherichi coli*.
Nouman Rasood, Naeem Rashid, Saima Iftikhar and Muhammad Akhtar
J. Biosci. Bioeng. 110: 381-385 (2010).

195. Conformational transmission in proinsulin and its derivatives: A study using H/D exchange.
Hooria Younas, Qurra-tul-Ann Afza Gardner, Naeem Rashid, J. Neville Wright, Muhammad Akhtar
Int. J. of Mass Spectrom. doi: 10.1016/j.ijms.2010.07.020 (2010).

196. Gene cloning and characterization of glycine oxidase from newly isolated *Bacillus subtilis* strain R5.
Farrukh Jamil[1], Naeem Rashid[1*], Qurra-tul-Ann Afza Gardner[1] & Muhammad Akhtar[1,2]
Biologia 66/1: 1-7 (2011).

197. A review of mechanistic studies on aromatase (CY19) and 17α-hydroxylase-17, 20-lyase (CY17)
Muhammad Akhtar, J. Neville Wright, Peter Lee-Robichaud
J. Steroid Biochem. And Mol. Biol. 125: 2-12 (2011).

198. Studies on the regioselectivity and kinetics of the action of trypsin on proinsulin and its derivatives using mass spectrometry.
Gardner QA, Younas H, Akhtar M. 2013.
Biochim Biophys Acta. 1834: 182 – 190.

199. Studies on the expression and processing of human proinsulin derivatives encoded by different DNA constructs.
Farheen Aslam, Qurra-tul Ann Afza Gardner, Hina Zain, Muhammad Shahid Nadeem, Muhammad Ali, Naeem Rashid, Muhammad Akhtar,
Biochim Biophys Acta. 1834: (2013) 2116–2123.

200. TK1299, a highly thermostable NAD(P)H oxidase from *Thermococcus kodakaraensis* exhibiting higher enzymatic activity with NADPH. *Journal of Bioscience and Bioengineering.*
Muhammad Atif Nisar, Naeem Rashid, Qamar Bashir, Qurra-tul-Ann Afza Gardner, Muhammmad Hassan Shafiq, Muhammad Akhtar. 2013.
Volume 116, Issue 1, July 2013, Pages 39–44.

201. Structural evidence for the partially oxidized dipyrromethene and dipyrromethanone forms of the cofactor of porphobilinogen deaminase: structures of the *Bacillus megaterium* enzyme at near-atomic reasolution.
N. Azim, E. Deery, M.J., Warren, B.A.A., Wolfenden, P. Erskine, J. B. Cooper, A. Coker, S.P. Wood and M. Akhtar.
Acta. Cryst. 2014: D70: pages 744-751.

202. Characterization and bioassay of post-translationally modified interferon α-2b expressed in *Escherichia coli*.
Fatima Ahsan, Amina Arif, Nasir Mahmood, Qurra-tul-Ann Afza Gardner, Naeem Rashid, Muhammad Akhtar
Journal of Biotech. 2014, 184: 11-16.

203. Pcal_1699, an extremely thermostable malate dehydrogenase from hyperthermophilic archaeon *Pyrobaculum calidifontis.*
Ghazala Gharib, Naeem Rashid, Qamar Bashir, Qura-tul Ann Afza Gardner, Muhammad Akhtar, Tadayuki Imanaka.
Springer Japan 2015, DOI 10, 1007/s00792-015-0797-3.

204. Hierarchy of N-acylation sites in human insulin studied by RP-HPLC and mass Spectrometry.
Zain, H., Ahmad, M., Gardner, Q. A. and Akhtar, M.
J. Chem. Soc. Pak. Vol. 37: No. 06, 2015;-1260-1266.

205. Production of human interferon alpha-2b in *Escherichia coli* and removal of N-terminal methionine utilizing archaeal methionine aminopeptidase.
Arif, A., Gardner, Q. A., Rashid, N. Akhtar, M.
Biologia. 2015 70: 982–987.

206. An extremely thermostable malate dehydrogenase from hyperthermophilic archaeon *Pyrobaculum calidifontis.*
Gharib, G., Rashid, N., Bashir, Q., Gardner, Q. A., Akhtar, M. and Imanaka, T. Pcal_1699, January 2016. *Extremophiles*. 20(1):57-67.

207. Glutathione dependent formaldehyde dehydrogenase homologue from *Bacillus subtilis* strain R5 is a propanol preferring alcohol dehydrogenase.
Raza Ashraf, Naeem Rashid, Saadia Basheer, Iram Aziz, and Muhammad Akhtar. Biochemistry (Moscow) 2016 82:13–23.

208. Pcal_1127, a highly stable and efficient ribose-5-phosphate pyrophosphokinase from *Pyrobaculum calidifontis*.
Tahira Bibi, Sumera Perveen, Iram Aziz, Qamar Bashir, Naeem Rashid, Tadayuki Imanaka, Muhammad Akhtar
Extremophiles 2016 20: 821–830. DOI:10.1007/s00792-016-0869-z.

209. Pcal_0768, a hyperactive 4-α-glucanotransferase from *Pyrobacculum calidifontis*.
Sumaira Mehboob, Nasir Ahmad, Naeem Rashid, Tadayuki Imanaka, Muhammad Akhtar
Extremophiles 2016 20: 559–566.

210. NMR studies on mechanism of isomerisation of fructose 6-phosphate to glucose 6-phosphate catalysed by phosphoglucose isomerase from *Thermococcus kodakarensis.*
Shahzada Nadeem Abbas, Kenneth Hun Mok,Naeem Rashid, Yongjing Xie,Manuel Ruether, John O 'Brien, and Muhammad Akhtar (2016)
Bioorganic Chemistry. 2016 66: 41–45.

211. Pcal_1699, an extremely thermostable malate dehydrogenase from hyperthermophilic archaeon *Pyrobaculum calidifontis.*
Ghazaleh Gharib, Naeem Rashid, Qamar Bashir, Qurra-tul-Ann Afza Gardner, Muhammad Akhtar and Tadayuki Imanaka.
Extremophiles. 2016 20: 57–67. 10.1007/s00792-015-0797-3.

212. Biased expression, under the control of single promoter, of human interferon α-2b and *Escherichia coli* methionine amino peptidase genes in *E. coli*, irrespective of their distance from the promoter.
Amina Arif, Naeem Rashid, Farheen Aslam, Nasir Mahmood and Muhammad Akhtar.
Pak. J. Pharm. Sci. 2016 29: 375–379.

213. Structural studies of substrate and product complexes of 5-aminolaevulinic acid dehydratase from humans, *Escherichia coli* and the hyperthermophile *Pyrobaculum calidifontis*.
N. Mills-Davies, D. Butler, E. Norton, D. Thompson, M. Sarwar, J. Guo, R. Gill, N. Azim, A. Coker, S. P. Wood, P. T. Erskine, L. Coates, J. B. Cooper, N. Rashid, M. Akhtar and P. M. Shoolingin-Jordan.
Acta Cryst. 2017 D73: 9–21.