The laboratory was established in 1988.

Head of Laboratory Grechkin Alexander N., Academician of RAS



Lab members

Mukhitova F.K., Cand.Sc. (Chemistry), Senior Research Scientist Chechetkin I.R., Cand.Sc. (Biology), Senior Research Scientist

Mukhtarova L.S., Research Scientist

Yarin A.Y., Cand.Sc. (Biology), Research Scientist

Antsygina L.L., Junior Research Scientist

Blufard A.S., Cand.Sc. (Biology), Junior Research Scientist

Lantsova N.V., Junior Research Scientist

Ogorodnikova A.V., Junior Research Scientist

Gorina S.S., Postgraduate Student

Ermilova V.S., Postgraduate Student

The aim of research and our major interests:

Plant lipoxygenases. Studies of the molecular mechanisms of catalysis and the search for new physiologically active products.

Areas of current interest:

Studies of the plant lipoxygenase signaling cascade, including search for new signal mediators, elucidation of their biosynthetic pathways and mechanisms, as well as their role in reprogramming of the genome expression and protein synthesis;

Studies of the molecular mechanisms of catalysis of enzymes from CYP74 family, including identification of the primary determinants of catalysis.

To study metabolism of polienoic fatty acids and their hydroperoxides, we use enzymes isolated from plant tissues as well as recombinant enzymes (lipoxygenases and CYP74 cytochrome family) and their mutant forms prepared by site-directed mutagenesis.

Equipment:

1. Gas chromatograph mass spectrometer GSMS-QP5050A (Shimadzu, Japan);

2. Nanoelectrospray and electrospray LC-MS/MS system MicroTOF-Q (Bruker, Germany), including the LC Packings nano-HPLC system;

3. On-line flow scintillation radiodetector for HPLC (Beckman, USA);

4. Two UV-Vis diode array detectors SPD-M20A for HPLC (Shimadzu, Japan);

5. Spectrophotometer Varian Cary 50 (Varian, USA);

6. Chiral-phase column for HPLC Chiralcel OD-H (Daicel Chemical Industries, LTD, Japan);

7. Ultracentrifuge Optima MAX-E (Beckman Coulter, USA);

8. Deep freezers MDF-U50V (Sanyo, UK – Japan);

9. Two gradient analytical HPLC systems (Gilson, France-USA).

Selected publications for the last 5 years (2007-2012):

- Medvedeva N.V., Mukhtarova L.S., Mukhitova F.K., Balandina A.A., Latipov S.K., Grechkin A.N. Cyclization natural allene in aprotic solvent: Formation the novel methyl cis-12--10-phytoenoate. Chem. Phys. Lipids. 2007. V.148, No2, P.91-96.
- Grechkin A.N., Ogorodnikova A.V., Gnezdilov O.I., Mukhtarova L.S. Detection of pathway from linoleate to novel cyclopentenone *cis*-12-oxo-10-phytoenoic acid in sunflower roots. Chem.Bio.Chem. 2007. 8, No18, P.2275-2280.

- Chechetkin I.R., Mukhitova F.K., Gogolev Yu.V., Grechkin A.N. Regio- and Stereospecificity Recombinant Soybean Lipoxygenase-2. Doklady Biochemistry and Biophysics 2007. V.415, P.225–227.
- Alexander N. Grechkin, Lucia S. Mukhtarova, Larisa R. Latypova, Yuri Gogolev, Yana Y. Toporkova, and Mats Hamberg . Tomato CYP74C3 is a Multifunctional Enzyme not only Synthesizing Allene Oxide but also Catalyzing its Hydrolysis and Cyclization. Chem.Bio.Chem. 2008. V.9, No15, P.2498-2505.
- Yana Y. Toporkova, Yuri V. Gogolev, Lucia S. Mukhtarova, Alexander N. Grechkin. Determinants governing the CYP74 catalysis: Conversion of allene oxide synthase into hydroperoxide lyase by site-directed mutagenesis. FEBS Lett. 2008. V.582, No23-24, P.3423-3428.
- Anna V. Ogorodnikova, Larisa R. Latypova, Fahima K. Mukhitova, Lucia S. Mukhtarova,Alexander N. Grechkin. Detection of divinyl ether synthase in Lily-of-the-Valley (Convallaria majalis) roots. Phytochemistry. 2008 V.69, No16, P.2793-2798.
- Alexander S. Blufard, Fakhima K. Mukhitova, Andrey Y. Yarin, Larisa L. Antsygina, Ivan R. Chechetkin, Alexander N. Grechkin. Unprecedented pathogen-inducible complex oxylipins from flax: linolipins A and B. FEBS J. 2009. V.276, No16, P.4463-4472.
- Chechetkin I.R., Osipova E.V., Tarasova N.B., Mukhitova F.K., Hamberg M., Gogolev Y.V., Grechkin A.N. Specificity of oxidation of linoleic acid homologs by plant lipoxygenases. Biochemistry (Moscow). 2009. V.74. No8, P.855-861.
- Lantsova Chechetkin I.R., Mukhitova F.K., Hamberg M., Grechkin A.N. Hexadecanoid pathway in plants: lipoxygenase dioxygenation of (7 *Z*,10*Z*,13*Z*)-hexadecatrienoic acid. Biochemistry (Moscow) 2010. V.75, No6, P. 708-716.

- Toporkova Y.Y., Osipova E.V., Mukhtarova L.S., Gogolev Y.V., Grechkin A.N. Alteration of catalysis of CYP74C subfamily enzymes as a result of site-directed mutagenesis. Dokl. Biochem. Biophys. 2010.
- Mukhtarova LS, Mukhitova FK, Gogolev YV, Grechkin AN. Hydroperoxide lyase cascade in pea seedlings: Non-volatile oxylipins and their age and stress dependent alterations. Phytochemistry. 2011. V.72, . No4-5, 356-364.
- Chechetkin I.R., Osipova E.V., Antsygina L.L., Gogolev Y.V., Grechkin A.N. Oxidation of glycerolipids by maize 9-lipoxygenase and its A562G mutant. Chem. Phys. Lipids. 2011. V.164, No3, P.216-220
- Alexander N. Grechkin, Natalia V. Lantsova, Yana Y. Toporkova, Svetlana S. Gorina, Faina K. Mukhitova and Boulat I. Khairutdinov. Novel Allene Oxide Synthase Products Formed via Favorskii-Type rearrangement: mechanistic implications for 12-oxo-10,15-phytodienoic acid biosynthesis. Chem.Bio.Chem. 2011, V.12, P.1-8.
- Gogolev Yu.V.,Gorina S.S., Gogoleva N.E., Toporkova Y.Y., Chechetkin I.R., Grechkin A.N. Green leaf divinyl ether synthase: gene detection, molecular cloning and identification of a

unique CYP74B subfamily member. Biochim.Biophys.Acta. 2012. V.1821, No

Grants:

RFBR No 12-04-01140-a (2012-2014); Principal Investigator Grechkin A.N.

RFBR No 12-04-97059-r (2012-2014); Principal Investigator Grechkin A.N.

RFBR No 12-04-01504-a (2012-2014); Principal Investigator Chechetkin I.R.

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Grant from the Russian Academy of Sciences (program ‘Molecular and Cell Biology’); Principal Investigator Grechkin A.N.

Grant No 14.740.11.0797 from the Federal Target Program (2010-2012); Principal Investigator Grechkin A.N.

RFBR No 12-04-31632_mol_a (2012–2013); Principal Investigator Gorina S.S.